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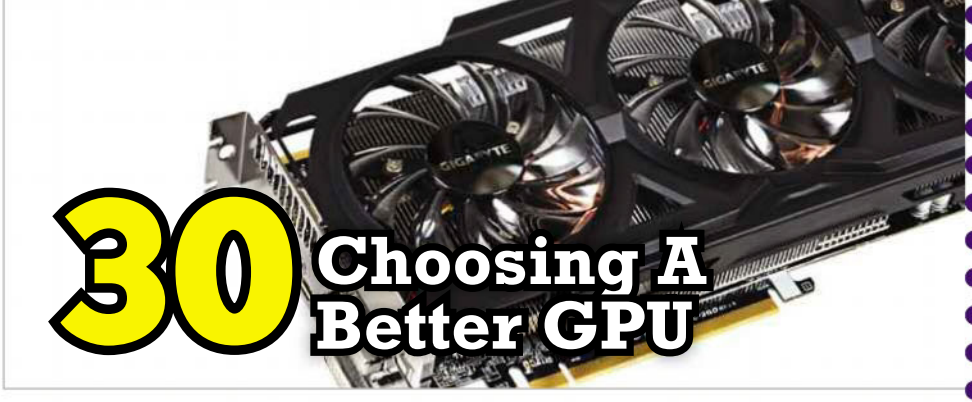

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Speed Up Your PC For Free

Get out of the PC slow lane, with some of our handy speed tips

When a PC starts to get a bit old, you might start wondering whether it's time to spend money on an upgrade. But before you do that, it's worth having a look at what you can do to speed up a system without spending any money!

Most of the time, people don't upgrade their PC because their current one isn't capable of doing what they want; they upgrade because it's become bad at doing what they want. But inside the slow, chugging system you own is the lightning-fast system you bought. You just need to know how to draw it back out.

That's why we've come up with a few ways you can 'upgrade' your system for free. Take the advice in this article and we can guarantee your system will run better without you having to spend a single penny on it.

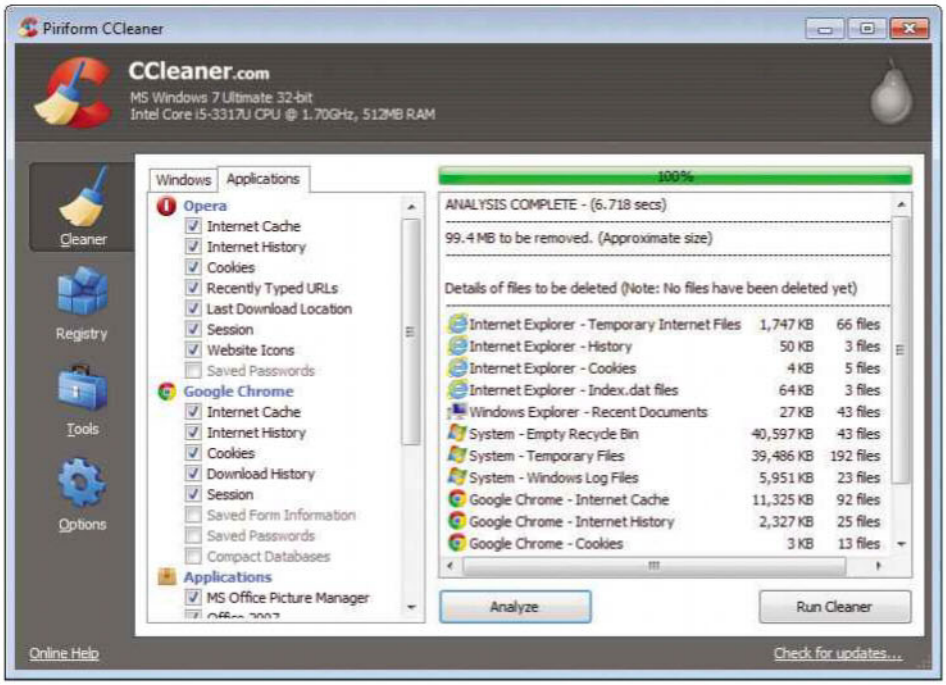
Speed Up Your Hard Drive

Hard drive speed is directly related to system performance, and what most people interpret as a lack of RAM or a slow processor is actually the result of a hard drive that's just become so cluttered and disorganised that the system can't get the data it needs quickly enough. Improving your disk access speed allows your system to boot quicker, load applications faster and can even improve the frame-rates in games. With that in mind, here's how to get your hard drive running like it's new.

1. Delete Any Temporary Files.

The first and most obvious piece of advice you'll hear, but that's because it's as true now as it ever was: deleting temporary files is a great way to recover space and reduce the number of files on your system, both of which make it run faster.

That's because Windows has a lot of temporary directories, and if you don't keep on top of them, your old and unwanted files can build up to enormous proportions. Although you never use these files, they still get



indexed for searches, scanned for viruses and defragmented when you run defragmentation. They waste your time and space merely by existing!

The quickest way to find these files is to type '%TEMP%' into the search box or run dialogue and press enter. Everything in this folder (it'll be something like 'C:\Users\<yourname>\AppData\Local\Temp') can be safely deleted. Some files may currently be in use, but don't worry, they can be deleted in the future instead.

To find other temp files on your system, you may want to use a program to find them for you. Piriform makes an app called CCleaner (www.piriform.com/ccleaner), which can automatically cleanse your PC of all common temporary files, including cookies, web history, temp files and recycle bin items. You don't need to run it often, but it'll spot things even the most careful manual search would miss.

2. Run Defragmentation

Once you've reduced the amount of unnecessary files on your hard drive, you should now defragment it to speed up access times.

Defragmenting a hard drive takes ages, but it's the best way to improve access times without completely wiping the drive and starting again. All files take up disk sectors, and fragmentation is what happens when large files are split up and placed in non-consecutive disk sectors – usually because there's no gap big enough to contain them all (which tends to happen because a drive got too full).

If that sounds complicated, imagine it a bit like filing books. The logical way to store all seven Harry Potter books would be to place them next to each other, so you can instantly get the next one when you need it. If there isn't enough space on your shelf, you might have to place them in gaps far apart. When the time comes to retrieve those books, it takes you more time to get them if they aren't next to one another. The same principal applies to files that have been broken up. They don't take up any more space, but they do take more time to retrieve, and the more fragmented the drive is, the more this time stacks up.

Defragmentation essentially moves all the books on the shelf into the most logical order. Large files are stored in single, continuous chunks, and the most frequently accessed files are stored in the places that are easiest to read from.

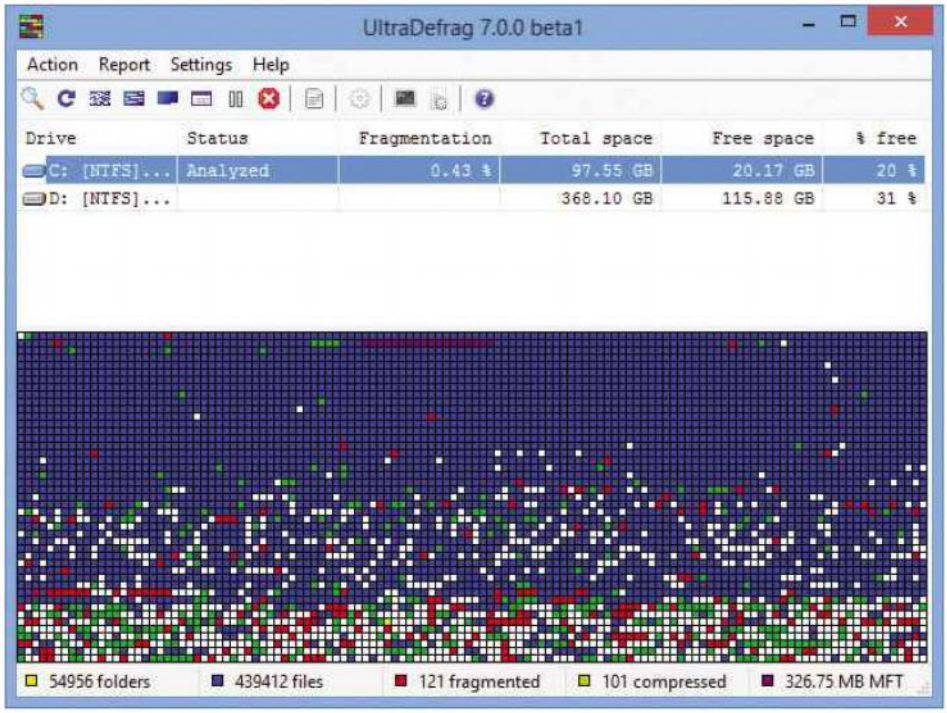
Unfortunately, modern hard drives take huge amounts of time to defragment completely, which can be very inconvenient. An alternative is to use a program such as Piriform's Defraggler (**www.piriform.com/defraggler**), which allows you to defragment and optimise individual files and folders, such as game directories, your Windows directory or your inbox.

Speed Up Your RAM

If you can't or don't want to install extra RAM, there are still things you can do to improve the way your current memory operates. Faster memory access ensures smoother and more reliable operation, which is something everyone wants! RAM itself is actually very fast, but it often has to interact with its 'pagefile', a section of your hard drive that it shunts data in and out of when it's not in use, so to speed up your RAM, you actually have to speed up pagefile access. How do you do that?

1. Defragment The Pagefile

One way is to defragment it. The principle is the same as we just explained, but the pagefile is a special case. The pagefile (normally called 'pagefile.sys' and found



in your Windows drive's root directory) is constantly being written and rewritten to, which makes it very fragmented. This also means you can't actually defragment it from within Windows, because it's always locked and in use.

What you can do is download a program like UltraDefrag (**ultradefrag.sourceforge.net**). You can use this to defragment your pagefile before Windows has booted, using its 'boot time defragmentation' mode.

2. Move The Pagefile

Along similar lines, you can speed up pagefile access by storing it on the fastest possible storage medium, whether that's a solid-state drive, a fast hard drive or even a USB key.

If you have two physical hard drives that are the same speed, you can improve RAM speed by storing the pagefile on the drive you use the least. This will ensure your system's resources are shared more evenly between the two drives: you can run a program or game off one drive, while the other is reading and writing to virtual memory, meaning neither operation gets interrupted by the other.

To move your pagefile, click on the Start menu, type 'Advanced System Settings' in the search box and click 'View advanced system settings'. Under the 'Advanced' tab, find the section called 'Performance' and click 'Settings.' Again, under the 'Advanced' tab, find the 'Virtual Memory' section and click 'Change…'

Here, you can uncheck 'Automatically manage paging file size for all drives', then choose another drive for the pagefile to go on. You'll need at least as much space as you have RAM – so 4GB of space for 4GB of RAM. Once you've done this, click 'Set', then completely remove the pagefile from the original location (usually C drive). Click OK to exit on each dialogue until prompted to reboot, then do so.

> **"Defragmenting a hard drive takes ages, but it's the best way to improve access times without completely wiping the drive"**

Speed Up Windows

Your Windows installation might look as simple as the day you installed it, but months (or years!) of application installations, system tweaks and settings changes will have definitely slowed it down, so gradually you might not even realise. What can you do to speed it up again?

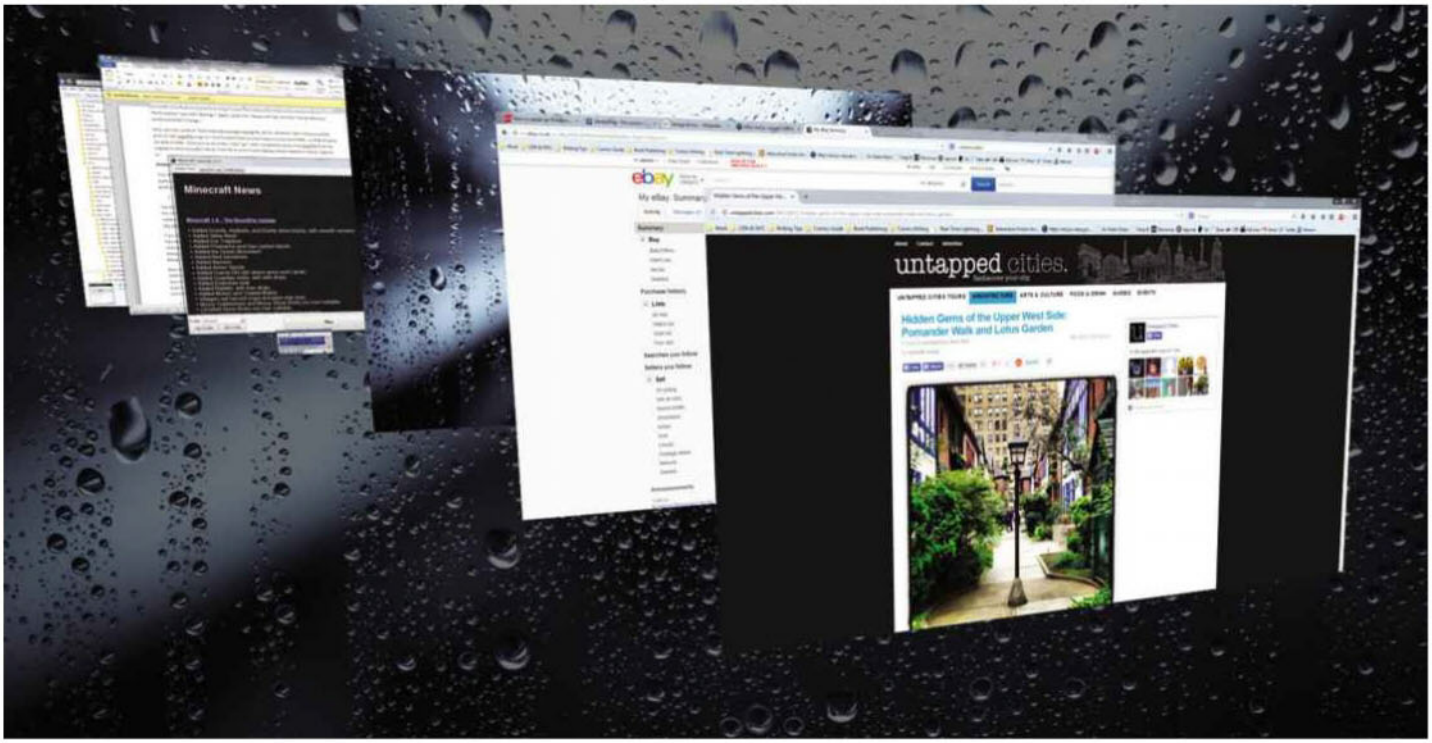
1. Disable Visual Effects

You may not realise, but disabling the visual effects in Windows can free up processor and graphics resources so they can be used for more pressing concerns. It's unlikely to make much difference if you have a sufficiently advanced GPU, but on low-resource systems it's an absolute must.

To turn off effects, right-click 'Computer' and select 'Properties'. From this dialogue, select 'Advanced System Settings', then under the 'Advanced' tab, find the 'Performance' box and click 'Settings'. Here, you should select the 'Custom' radio button, then uncheck as little or as much as you like in the box below. You may want to keep some of the effects enabled (particularly 'Smooth edges of screen fonts'), but each one you deselect should make Windows that little bit more responsive.

2. Reinstall Windows

The extreme solution to chronic Windows slowdown is drastic but has a 100% success rate: you have to reformat your hard drive and reinstall Windows from scratch.



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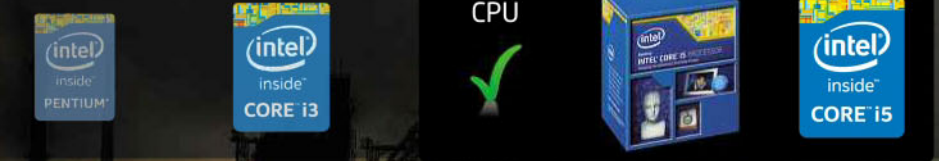

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Over time, operating systems become slow and cluttered. Every program you install and uninstall leaves its mark, and eventually it's almost impossible to get the system running as fast as when it was originally set up thanks to the general mess they leave behind. If you have a copy of Windows available, you do have the option to throw in the towel and start afresh with a clean installation. It's certain to be faster, although it does take quite a lot of preparation and configuration to ensure you don't lose all your important files, so it really should be a last resort.

If you choose to take this route, preparation is important. Before you reformat your drive, remember to make extensive backups. You're not going to enjoy using a faster PC if you lose all your documents, downloads, emails and programs as a result! When you're sure you have everything saved, deleting and reinstalling Windows will leave you with a PC that runs almost as well as the day you bought it. It's a bit too extensive a process to guide you through here, but look online for 'clean install' instructions if you're interested in trying it out. Remember that you'll need a legitimate copy of Windows or a valid system restore disc from your retailer!

Speed Up Your Graphics Card

If you have a graphics card that's starting to show its age, you don't necessarily have to replace it. To conclude this article, here are our tips for improving your card's performance without switching out any hardware.

1. Install Better Drivers

As a general rule, you don't speed up your computer by installing new software. The exception to this rule is with graphics drivers, which are often released precisely because they speed games up. In this case, you're not adding extra software, you're replacing the existing code with better code.

This largely only applies if you have a separate video card (on-chip GPUs don't usually need their own drivers), but otherwise keeping the latest graphics drivers is the best way to make sure you're getting the best speeds out of your hardware, particularly in the most recent games.

If you're feeling particularly adventurous, you could also take an alternative step and install third-party drivers. While you'll only get proper support if you're using the official ones, alternative driver releases (such as the Omega drivers for AMD/Radeon cards) are compiled by enthusiasts to give you the best combination of features and performance and go beyond what the official releases offer – but on the understanding that if anything goes wrong, you're responsible for it!

In practice, it's not likely that anything bad will happen. At best, you'll see faster speeds out of your graphics card. If you're unlucky, the speeds in the game you're playing will be slightly slower. At the absolute worst, they might fail to run completely, and all you have to do to fix the situation is roll back the drivers or reinstall the official ones. It's usually worth the risk!

2. Tweak Your Card Settings

Whatever drivers you're using, you should be able to tweak the way your GPU behaves in order to give it a virtual kick up its virtual rear.

The bottom end of this practice involves changing simple options. Lowering the overall resolution is an easy way to relieve the burden on the graphics card, and removing post-processing effects like anti-aliasing or filtering can also have a positive effect on speed at the expense of image quality. You can get faster frame rates by disabling V-Sync, which artificially delays frames to ensure they're displayed in tandem with the refresh rate of your monitor. The less your card has to do in general, the faster the frame-rates you can get out of it.

However, if you want your card to run faster but don't want to sacrifice any image quality, you do have another option: you can overclock it. As with CPU overclocking, GPU overclocking is best left to experts and can damage your system if improperly applied, but it's also a great way to 'upgrade' your graphics card without physically replacing it.

How you overclock your card is a delicate process to go into here, but the first port of call should be your card's configuration software, which will allow you to change the speed of the GPU clock and memory clock (assuming it's possible). The faster they run, the better your card's performance should be, but increasing the speeds will also heat the GPU up, which makes it less stable. The art to overclocking is finding the point where the card is running at its fastest without becoming too unstable to play. It's not strictly an upgrade, but it certainly feels like it! **mm**

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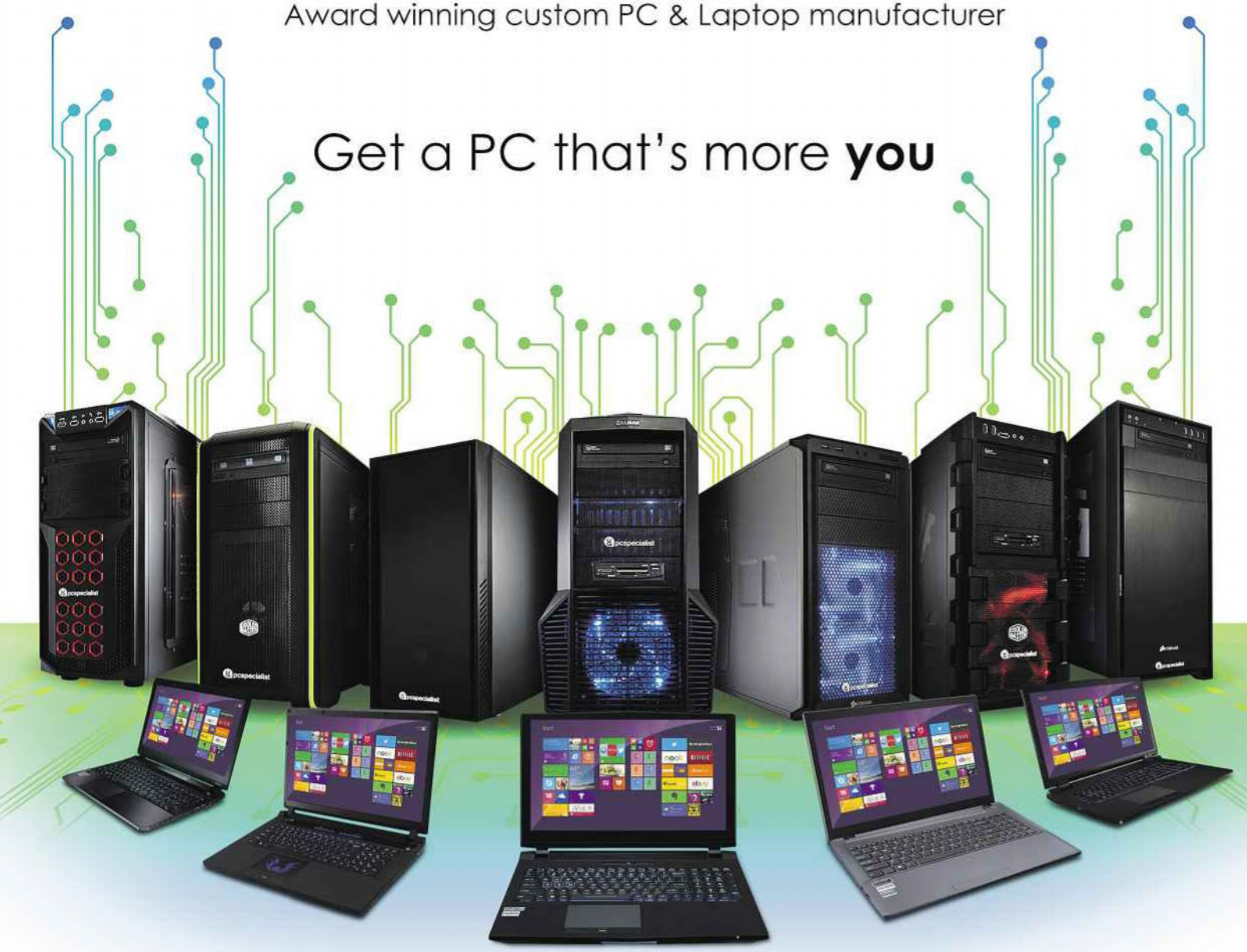

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Choosing The Best Value Upgrade

Getting value for money from an upgrade can seem like a lottery, but that's not always the case

Since most of us have only a limited amount of money to play with at any given time, choosing how and when to upgrade our computer hardware is something that we have to give careful consideration. We need to select the right hardware, and we need to do it in such a way that our money gets the most performance for the amount we spend. Or, even more importantly: doesn't leave us with creaking, out-of-date components once a year has passed.

Improving your PC doesn't have to be an expensive gamble, though, as we hope to prove over the next few pages. So, jhere's how you can boost your system without spending too much money.

Add An SSD

Solid State Drives (SSD) are plummeting in cost, and that – combined with the sheer level of speed improvements they offer – makes them an attractive prospect for anyone looking to upgrade. You can get 500GB drives for around £150 and 250GB drives for about £70, either of which will be large enough to run an operating system from – though both would be best paired with a mechanical hard drive for media storage, admittedly.

The thing SSDs do best is eliminate the bottleneck mechanical hard drives cause on modern systems. Their higher read and write speeds allow them to shift data around your system faster than any mechanical hard drive could hope to, and this causes

a general speed increase in everything from system boot time to to in-game framerates. A lot of the slowness that you might attribute to aging or inadequate hardware is caused by the sheer time it takes to fetch the data from your hard drive and load it into memory.

Even a basic, low-end, aging SSD will be several times quicker than any mechanical hard drive you can compare it to, so in terms of the improvement you'll see for your money, it's tough to find an upgrade that can offer better results. Don't rush to get one right away, though. To see the full benefit of an SSD drive you'll need to be running both Windows and your software from it (to ensure that the data isn't getting stuck in the slow pipelines of a mechanical drive) and because you're replacing your primary drive with a new one, SSD upgrades do require you have some idea about how storage upgrades work.

At the very least, you need to know how to keep your old data available once the new drive has been installed and assigned as your primary storage. Some SSDs come with apps that help you do this, but not all. If you're used to doing this, a fresh install might appeal more anyway – but it is a step that you can't really skip, and not an especially simple one.

Although SSDs have only a limited amount of space, it's worth thinking of them not as storage devices alone, but as high-speed drives. While they might not be the best value if you're looking to expand the amount of storage you have in your system, in terms of the improvement they can offer, they're definitely the best value upgrade around.

Add A Graphics Card

Assuming you don't have one in your system already, you can improve any system by simply adding a graphics card. While it mostly affects gaming performance, it also has a positive effect on everything from the speed of your OS to the way video playback performs. Onboard GPUs might be cheap, but they're not designed for intensive use. If you install a separate GPU you'll feel the benefits in several places.

Almost any system of reasonable power – even Core i3s and low-end AMD chips – will become an acceptable gaming machine once you put a graphics card in. As little as £75 can buy one that'll best any integrated GPU you might be using, and you don't even have to stick to recent generations of card to guarantee an improvement. Thus, end-of-line and open-box bargains can be found everywhere.

The exact level of upgrade does depend on which type of integrated GPU you're using, though. On AMD chips it's easy to tell, because you just pick one better than its onboard Radeon chip. If you're running a Sandy Bridge or Ivy Bridge Intel chip, virtually anything from the last generation or two of graphics card will be a vast improvement. If you're running a Haswell chip the GPU is slightly better, but still much weaker than most discrete cards.

Adding a graphics card isn't even a very difficult procedure at this end of the market. If you're installing a very powerful card you'll have to think about things like system temperature, power drain and interior air flow, but most sub-£100 models should run fine off all but the most weedy PSU. As long as you have a free PCI slot and a power supply stronger than about 350W, you won't even need to look at the rest of your system to check the power levels are okay.

Upgrade Your CPU

If you want a faster system and you're sure that the problem isn't your storage speed – either because you own an SSD already or because the problem is related to something like video encoding, which is a CPU-intensive activity, then a new CPU is of course worth considering. CPU upgrades have the benefit of improving a system's responsiveness more generally too, so the money you spend on it will definitely be good value.

If your PC runs on a recent Intel platform, then there's a good chance you have plenty of room to upgrade it without having to replace your motherboard as well. Sandy Bridge motherboards from several years ago can take any socket LGA1155 CPU, from the lowliest Sandy Bridge Celeron up to an Ivy Bridge Core i7. Unless you started with one of the faster Ivy Bridge chips, you shouldn't have much trouble finding an upgrade that's worth making.

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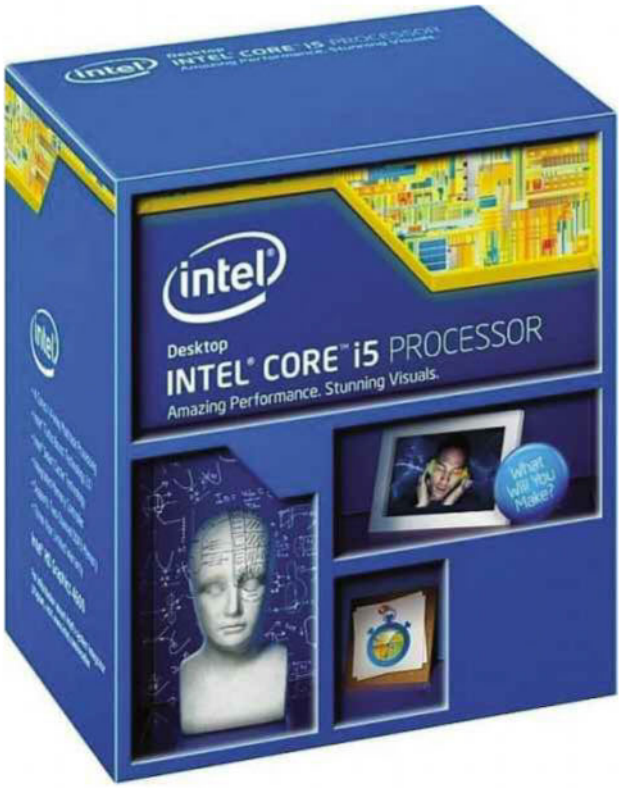

Install Extra RAM

Additional RAM can be a simple way to upgrade any system, but it does heavily depend on how much you have already. Extra RAM helps most obviously with things like multi-tasking and tabbed browsing and can help applications launch quicker because it affords less reliance on the system's swap file – but it's also one of the areas where you can spend a lot of money and see virtually no effect.

Generally speaking, if you're running a 64-bit version of Windows you should have 4GB of RAM as the absolute minimum for a functional system. 8GB is the minimum amount you need to run your operating system comfortably, so if you have less than that you probably will see a small improvement in your system if you add more.

Beyond that point, there's a strong likelihood that more RAM won't have much of an effect, and the chance you'll see a visible improvement becomes smaller and smaller. 16GB is currently more than any non-specialist system needs, and if you add more than that it's only likely to be of benefit to systems which have particularly heavy RAM usage – media editing and 3D rendering systems, for instance.

> **“16GB is currently more RAM than any non-specialist system needs”**

Unfortunately, if you're running a Haswell chip or a pre-Sandy Bridge Core CPU, it's harder to upgrade your processor without replacing the motherboard at the same time, at the absolutely minimum. You could, however, see if your chip has support for any overclocking features. If your chip's serial number has a 'K' after it (e.g. it's an Intel Core i5-2500K) then the hardware is considered unlocked and ripe for overclocking (as long as your motherboard supports the feature too). There are risks associated with doing this – overclocked chips run hotter, which makes them less stable and more prone to damage, so you may need to improve your cooling system to maintain the quality of performance you're accustomed to.

If you have an AMD system it is, in many ways, an easier process than upgrading an Intel system. That's because they only have two major socket types which are compatible with a larger number of chips. While its FX-series chips are slowly disappearing from the market, but you can still fit one in any Socket AM3+ motherboards; so if you have an existing FX-series chip you can upgrade quite far without having to buy new hardware. It's not a bad upgrade, but it is worth pointing out that for the same price as a high-end FX chip you could probably buy a new motherboard and an Intel chip of comparable performance, which would give you a better upgrade path in the future.

Fusion APUs are slightly more fragmented than the FX series chips, with both FM2 and FM2+ chips available to buy. The good news is that they have built-in Radeon GPUs, which you can even run in crossfire mode if you have a stand-alone card from a similar enough model line. That means you won't be stuck with a GPU you can't use. On this level, Intel can't compete at all. It's worth remembering, though, that the value for money on any AMD upgrade isn't particularly great, so it's only worth doing if you're particularly averse to buying and/or installing a new motherboard as well.

Be particularly careful if you're adding RAM to improve gaming speeds, because there are only certain situations in which it makes a difference. Even the most recent games don't use more than a couple of gigabytes of RAM unless you really crank up the settings. Games rely more heavily on graphics memory than system memory. If you're only running an integrated GPU, your graphics RAM is the same thing as your system RAM, and therefore low system RAM can be a problem that you can fix. Similarly, if you have an exceptionally small amount of RAM, such that your operating system struggles to keep up, another stick or two will certainly improve your gaming performance a little.

We appreciate that it can be tempting. RAM upgrades are easy to install and cheap to get hold of. Just don't let the ease fool you into thinking it's definitely worth doing – not all RAM upgrades are as good value as others!

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Upgrade Your Cooling

We've already mentioned how an improved CPU cooler can allow you to overclock your chip and squeeze more power out of existing hardware. The same is also true of other forms of cooling in your system. Graphics cards, for example, can be fitted with custom coolers that allow you to overclock them without fear of causing damage.

This might mean fitting a secondary (or tertiary) fan, an additional heatsink or a water-cooling system. Unlike CPU fans, however, additional cooling of this manner can be tricky to install and should not be attempted unless you have full confidence in your abilities. Remember that most high-end graphics cards already have multiple cooling systems, so it may not be possible to add more!

Another alternative might be adding extra cooling features to your case. A lower ambient temperature in your case will let graphics cards, RAM and processors cool down quicker, allowing them to run faster whether they're overclocked or automatically stepped by a built-in thermometer.

The simplest way to cool your system temperate is to add exhaust fans, which aid the removal of warm air. You do have to contend with increased noise as a result, but it's a small price to pay for a faster system. More complicated cooling methods might involve creating air ducts by drilling strategically placed holes in your case, but that's a trick for those who like to get their hands properly dirty.

If you're of a less powertool-happy disposition, you can achieve similar cooling effects by rearranging your internal components to eliminate warm air pockets and cables that may impede air flow or (even more simply) by making sure components, their heat and their fans are kept dust-free. You'd be surprised how much heat a layer of fluff can keep in!

Upgrade Your Motherboard

Speeding up your system through a motherboard upgrade isn't impossible, but it does rely on you successfully identifying areas on your current system which are in need of improvement. In most cases, model and manufacturer don't matter so much as the motherboard's chipset, which determines the capabilities and compatibility of a motherboard.

If you have (or are buying) an Intel processor, make sure you get a Z-series board (i.e. Z97) because they support full overclocking of both the RAM and CPU and allow multi-GPU configurations, whereas other motherboards omit some or all of this support. Chipsets beginning with Q or B are Intel's 'Business' line and should not be used in a home PC (you'd be paying for enterprise features you don't need) while those beginning with H are the 'home' boards – stripped down versions of the Z ones with slightly fewer features.

If you're buying an AMD-compatible motherboard, you should look for boards compatible with their GPU-integrated FM2+ chips. Unlike Intel motherboards, you also need to pay attention to chipset suffixes. FX boards support up to Quad-card CrossFire, while X boards support just two cards.

As well as support for a faster CPU, chances are you'll find more USB 3.0 ports and more SATA 6GB/s ports on your new motherboard, which helps future-proof your machine. It's easy to forget that sometimes systems are slow because the underlying architecture of the board doesn't give them a choice. If you only have USB 2.0 or SATA 3GB/s, you may not see the full benefit of your components and peripherals.

> **"If you only have USB 2.0 or SATA 3GB/s, you may not see the full benefit of your components and peripherals"**

Of course, motherboard upgrades are arguably the worst value around, purely because changing it often requires you to buy a new CPU and RAM as well. Of course, if your system is getting on a bit, trying to upgrade your system without changing the motherboard will prove a false economy. If it's more than about four years old, it's worth spending the money to upgrade the lot rather than try and stick to your current motherboard – you'll only end up spending your money on old components when the same cash could go a lot further (in performance terms) on new hardware! **mm**

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Overclocking
Risk Vs Reward

Should you go down this road or not? James Hunt looks at the pros and cons...

Whether you've bought new hardware that you want to push to the limits or you're trying to squeeze extra performance out of your existing components, overclocking might just be the way to do it.

If you're reading Micro Mart, it's a safe bet you've at least heard of overclocking, but a surprisingly small percentage of people have ever tried it. That may be because of the associated risks – the idea that your hardware could be permanently damaged, but it might also be because the rewards aren't quite obvious. Sure, your hardware will run faster, but how much faster? And at what cost?

Addressing And Minimising The Risks

The thing most people are concerned about when overclocking is that they'll end up with a permanently damaged piece of hardware that needs to be replaced, wasting both money and time. But even though it's possible to fry hardware by overclocking it, it's also quite easy to avoid doing that as long as you're careful.

The risk of overclocking damage is rooted in the chemical makeup of your components. CPUs, GPUs and RAM chips are made out of millions of transistors, which are themselves mostly constructed from semi-conductive silicon. The reason silicon is used is because its electrical resistance decreases when the temperature rises, which is the opposite of what happens in more common metals.

This means that if silicon gets hot enough, it becomes fully conductive, which results in an electrical short that can damage your hardware permanently. That's why you have to keep it cool. Ideally, you want your processor (CPU or GPU) to be kept in the region of 70-80°C, but that's only a rule of thumb. Some chips will have much higher tolerances, some a little lower, and you should be able to find a fairly reliable range for your hardware if you see how other overclockers got on with it.

In practical terms, overclocking involves raising voltage and multipliers, and the more you do that, the greater the likelihood of failure becomes. To mitigate the risks, start by making small increments in the multiplier and only step up the voltage when the chip becomes unstable because it's not getting enough power (you can tell when this happens, because the chip will be unstable at lower temperatures). Remember that even if someone else claims to have pushed the same model of chip to 4GHz, you shouldn't start there – every individual chip has different tolerances and if you go in too high, the damage might be instant.

A good way to check your system before (and after) you overclock is to run a stress test, which will tell you whether it's running correctly under its current settings. To do this, all you have to do is run a benchmarking tool with your CPU's default configuration so you have a baseline with which to compare

> **The risk of overclocking damage is rooted in the chemical makeup of your components**

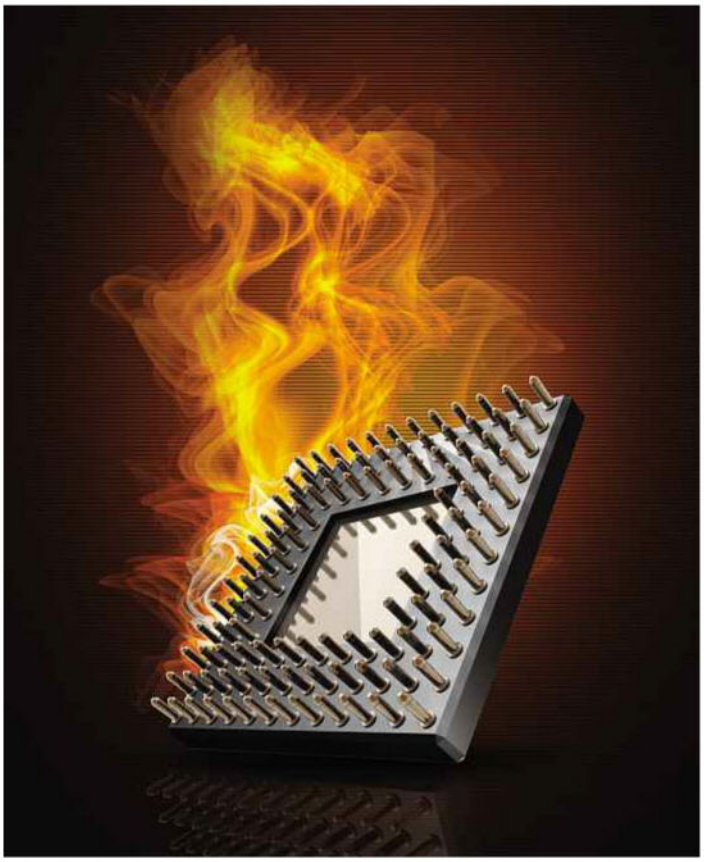
Do I Need To Overclock?

It's a simple question, but in a way it's really at the heart of this article. Most systems can be overclocked to some degree. But does every computer need to be overclocked? Clearly not. So how do you know whether you qualify or not?

The way to tell is to use benchmarking and load-monitoring software to see whether or not your components, at their current clock levels, are actually holding you back. Some tasks – gaming or media encoding, for example – use the CPU at full load, and an overclocked chip will definitely improve the times on that. If you're only doing word processing, then you could create the best, most high-end overclock configuration and you'd still see very little improvement in the way your system runs.

The same is true of graphics cards. Games tend to use the full availability of a GPU, but almost no other task does. One of the things to be careful about when you investigate overclocking is that just because it improves a benchmark, that doesn't mean it'll improve your day-to-day system usage. Benchmarks represent the high capability of your system, and if you never reach that anyway, then an increased benchmark is practically meaningless.

As we'd said elsewhere, in most average systems the real bottleneck is the hard drive, so don't think that overclocking your CPU will solve your slow-PC problems overnight. It'll improve performance in specific tasks where a faster CPU, faster GPU or more responsive RAM matters, but remember, that's not the same thing!



“Of all overclocking opportunities, RAM is probably the one most people don’t bother with”

future changes. AIDA64 (**www.aida64.com**) has a built-in Stability System Test, which you should run for a few hours to see how your system fares. If the hardware doesn’t crash, you know you’re safe to at least try overclocking – and if it does, you know you’re due a replacement!

The other thing that can negatively affect overclocked systems is, perhaps a little surprisingly, the PSU. If your power supply unit is cheap, old or otherwise inefficient, it might be providing a ‘dirty’ stream of electricity. A dirty supply gives an uneven voltage, which can spike and drop, leading to instability (or even damage!) in systems where the tolerance is tight – overclocked systems, for example. There’s no particularly easy way to test this without specialist equipment, but if you notice otherwise unexplained problems, your PSU might be the source of it. If you’re building a new system, try to buy a high-capacity, 80 Plus-rated PSU to ensure a clean supply of electricity.

CPUs

CPU overclocking is the most common kind. It’s quite simple to get to grips with but carries the most danger because processors are fragile, expensive and essential for system use. RAM can be cheaply replaced and graphics cards can be bypassed, at least temporarily, but if your CPU goes up in smoke, you basically have no choice but to buy another.

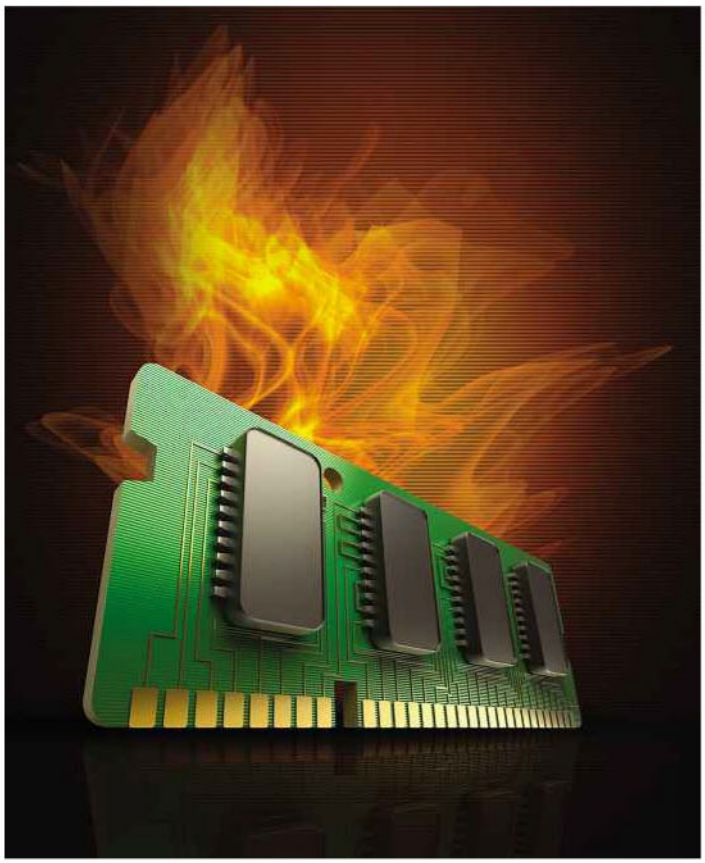
But overclocking a CPU is also a good way to improve a performance hike proportional to whatever the increase is, and with the right cooling, some chips can be made to work exceptionally well. Even now, the average overclockable Core i5 can be made to perform as well as the best Core i7s if you manage it correctly and the hardware tolerance is good enough. We’re not talking about small leaps here.

Gaming is the main area where you can see speed improvements, but any CPU-heavy tasks will benefit. Graphics rendering and video processing times will be cut as a result of the higher speeds, for example. As with all overclocks, the effect is most visible in area where the CPU speed is limiting your system’s performance, and those situations are rarer than you might think. If you want faster speeds in games, then it normally makes more sense to upgrade your SSD or GPU before you overclock your CPU.

Either way, the important thing when overclocking is that you keep the chip from getting too hot. That means that you’ll probably want to replace the OEM cooler and heatsink with a high-end version before you start. In any case, if you make sure the automatic temperature shut-off in your BIOS is enabled at a value about 5-10% lower than the temperature tolerance level for your CPU, you won’t have to worry about your hardware reaching it. If it gets too close, it’ll shut down and therefore be safe from damage.

RAM

Of all overclocking opportunities, RAM is probably the one most people don’t bother with in any specific way, largely because standard XMP profiles match the RAM to any overclocked CPU. But as with CPU and GPU overclocking you can get performance improvements by doing it manually, especially in gaming, where high frame-rates and huge data requirements mean RAM



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throughput gets taxed on almost any system. Part of what puts people off is that by default, RAM doesn't come with its own cooling, so it's tempting to imagine that it's running at its high tolerance already. This isn't really the case.

RAM itself is very low temperature even when overclocked. High-end modules might have heat-spreaders, but even they're mostly just there to look cool. If you're planning to overclock, you might want to look into an active cooling device, whether that's a memory-specific fan or an exhaust fan placed above the slots on your motherboard, but as long as you don't raise the voltages too, high there's very little chance of damage to your RAM; it's more likely that the rest of the system just won't be able to keep up.

The important thing to realise about RAM overclocking is that even though your system architecture might be rated at 1600MHz, that doesn't mean you're restricted to that speed. Intel and AMD guarantee minimum RAM speeds, but higher RAM speeds are possible with most chips. As with all forms of overclocking, it's a matter of tolerance. All chips are guaranteed to work at the minimum rated speed, but a significant number will fare no worse even with a much faster RAM clock speed. If you're really unlucky your hardware might be from a batch that can't go beyond 1600MHz, but it's far more likely that you can push 2000MHz and beyond.

Indeed, some tests have shown that every Intel i7 4770K CPU can handle RAM at speeds of 2800MHz. If you were to buy modules rated at that tolerance and install adequate cooling, you shouldn't see any system instability despite a 75% increase in performance. Lower-end chips are likely to have worse support, but even Core i3 CPUs are almost completely stable with RAM run at 2000MHz.

GPUs

Overclocking your GPU used to be a huge hassle, but as the popularity of it grew, manufacturers decided to embrace people's enthusiasm. Now, overclocking your GPU is even easier than overclocking your RAM or CPU: all you have to do is load up your graphics card's helper app and tweak the settings there. No reboot required!

Overclocking your GPU is a little riskier than overclocking your CPU, since the hardware operates on the same principles but doesn't have the same protection from the motherboard's temperature gauges. On the other hand, most GPUs come with two or even three active cooling fans, so at least you know that the temperature shouldn't get out of control unless you let it.

As with CPU overclocks, you need to get a benchmark for your system before you do it (if only so you can make sure you're actually getting better performance), so use a program like 3D Mark (**www.3dmark.com**) before changing any settings so you know what your hardware is currently capable of.

When overclocking your GPU, remember to keep an eye on your card's temperature and look out for glitches and artifacts that suggest not everything is going well. An overclocked CPU will crash your system when you demand too much of it, but an overclocked GPU will just struggle to provide proper visuals well before it gets into the real danger zone. You might also see the benchmarking app crash, slow down or even start returning lower results as the card reaches its limits, so as soon as you get to that point you should start to slowly drop the core clock speed.

Note that overvolting can improve a card's performance even further, but it's also likely to trash them. Even a small 'safe' overvolt could cause instability, increased wear on components and higher GPU temperatures. Unless you're desperate or prepared to kill your card, stick to stock voltages; in this case, the performance improvement you can get is vastly outweighed by the risk of trying to get it.

“Overvolting can improve a card's performance even further, but it's also likely to trash them”

The improved performance of an overclocked GPU will probably only be visible in graphically intensive tasks (typically gaming or when viewing high-definition media), so if your benchmarks are stable, try playing your favourite came and see if you notice any difference. The speed increase will only be proportional to the speed at which you increased the clock, so don't be surprised if it seems like a small amount. Many graphics cards are even sold with a slight overclock, so you might not be able to push them as far as you initially think, because some of the legwork was done for you!

Hopefully that's given you some idea of what to expect when you try to overclock your hardware, and what the risks of trying it are. If you're planning to overclock, remember that this isn't an exhaustive guide to the procedure, just a general overview. If you want to go ahead with it, you'll a more detailed guide. And it almost goes without saying that if you choose to overclock, then it's with full knowledge that your system can be permanently damaged as a result. Try it at your own risk! **mm**

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How To Find A Better Graphics Card

Choosing the right pixel pusher doesn't have to be hard

Buying a graphics card can be confusing at the best of times, especially if it's been a couple of years since you last picked one up. In a world of rebranded and rebadged cards, it's difficult to know what card does what.

That's why the best way to make sure you find a better graphics card could be to go back to first principles and learn how to read the specifications. To help you do that, here's our explanation of graphics card specs and how you can use them to look for a better, faster graphics card than your current one.

Chipset

A graphics card's chipset refers to the reference design it's based on. While graphics cards are produced by a variety of manufacturers, all cards with the same make and model number are based on a design produced by the original developer (usually AMD or Nvidia). This design is called the 'reference design', because individual manufacturers use it as a base to produce their own version, which may incorporate additional features or other modifications.

Importantly, all cards with the same chipset have broadly similar capabilities and can be directly compared with one another in ways that other cards can't. If they have the same chipset, they run on the same architecture, so it's comparatively easy to figure out which of the cards is better, because it's usually just the one with higher numbers!

If nothing else, it's worth paying attention to the chipset's process design, which is given in 'nm' (nanometres). As with CPU architecture, the smaller this value, the more energy efficient it is, and the faster it can run.

Core Clock Speed

A GPU (graphics processing unit) core is the processor of your graphics card and the bit that performs the rendering and calculations for graphics. Most cards quote two speeds: the base clock speed (which the card normally runs at) and the boost clock speed (which it temporarily switches to at times of high load). These values are given in megahertz (MHz), similar to normal CPUs, and dictate the number of updates that the GPU can make per second.

The confusing thing about clock speeds is that they can't be directly compared to check performance unless the chipset of the cards is the same. A card with an 800MHz clock speed can be faster than a card with a 1100MHz clock speed if the architecture is different!

If the chipset is the same, you can use clock speed to compare card performance to an extent, however. Cards with a higher clock speed perform more operations per second, so it's not uncommon for manufacturers to perform a 'factory overclock' and run it slightly faster than the reference design – particularly if they add extra cooling to increase the hardware's temperature tolerance.

Graphics Memory

It's something of a misconception that extra graphics RAM will improve performance. Having the minimum amount of necessary RAM available is important, but if you have more than that amount, it won't have any real effect. Far more important is the bandwidth of the memory you have available and the way it's utilised. A 1GB card with new firmware can outperform a 4GB card with old

firmware, so worry less about how much RAM is in your card and more on how well it performs. In the past the type of RAM was important, but most cards today use the superior GDDR5 type instead of the older, cheaper DDR3 type.

RAM bandwidth (which determines the amount of data that can be shifted in a single update) is affected by two factors: the memory clock rate and the memory bus size. Memory clock speeds are similar to graphics card clock speeds: the more MHz, the better the performance. Unlike GPU clock speeds, you can compare them across different cards as long as the RAM type is the same. The memory bus size is given in bits, and more bits means better performance. Most modern cards are likely to use at least a 128-bit memory bus, but you may see as high as 512-bit, with performance directly proportional to size.

As a rule, you can quickly compare available memory bandwidth by multiplying the bandwidth by the clock speed. The bigger the amount that comes out, the better.

Technology Support

All cards will quote, somewhere, which version of the two main graphics APIs they support. The latest version of DirectX is 12 and the latest version of OpenGL is 4.4. Don't worry too much if the card you're looking at only supports an older version. Most of the time this won't result in any notable performance decrease; it'll simply block off access to some of the latest effects and shaders.

Obviously, all things being equal, it's better to have support for newer versions than not, if only because it future-proofs the card, but new versions of DirectX and OpenGL still support older cards, and it would take years for your hardware to become so old as to be incompatible with the latest releases!

Similarly, support for multi-card operation – called SLI by Nvidia and CrossFire by AMD – is only of any importance if you plan to run multiple cards in tandem. To run cards like this, the GPU needs to be the same (or have very similar underlying technology), which means that most SLI/CrossFire users buy two cards together, making it something of a moot point to consider it for future upgrades. Some low-end cards explicitly will not support SLI and CrossFire (note that Nvidia cards never support CrossFire and AMD cards never support SLI), but in general, any card at the mid-to-high end of gaming will.

“The confusing thing about clock speeds is that they can't be directly compared to check performance unless the chipset of the cards is the same”

Resolution & Screen Support

Fairly straightforward, the resolution support tells you how sharp an image your card can provide. It's worth remembering that maximum resolution doesn't tell you how usable the output will be at that size. Just because a card can provide 4K output, it doesn't mean it can run games at a reasonable speed in 4K.

To get the most out of the card's resolution abilities, you'll need a screen of equivalent resolution and the proper digital interface. Note that analogue connections (such as standard VGA and DVI-I) top out at 2048 x 1536 regardless of the card you're using.

The number and type of interfaces can also have an effect on capabilities. Here's what you might find on a modern card:

Dual-Link DVI-I / DVI-D refers to a DVI interface with extra pins that allow it to reach resolutions of 2560 x 1600, instead of the single-link maximum of 1920 x 1200. DVI-I is a combined analogue/digital port, while DVI-D is digital-only. Your card may have both or just one.

HDMI is a high-definition audio/video interface available in several different versions. The most recent pair – HDMI 1.4 and 2.0 – both support 4K video and 3D video, but HDMI 2.0 is the only to support 4K in 3D. HDMI 1.4 also only supports 24Hz refresh rate for 4K and 3D video, whereas HDMI 2.0 supports the full 60Hz.

Finally, Display Port is a video interface designed to replace VGA and DVI. With adaptors it's backwards compatible with both ports and can also be used to carry other data such as audio and USB signals.

Usually, it's possible to utilise several of these ports at once – sometimes up to four, depending on how many there are – so check the maximum number of supported screens. Note that some chipsets support more screens than the card can physically accommodate!

Once you know what you're looking for, choosing a good graphics card will become a much simpler process. Now all you have to do is decide how much you want to spend! **mm**

Avoiding Bad Advice

PC Maintenance Myths

Not everything you're told is worth listening to...

There are many thousands of people who want to speed up their PC, so it's no surprise there's a small industry around telling people how to do it. The problem is that not everyone is trying to offer genuine solutions. In many cases, they're just cannibalising lists of recommendations from other websites. But spotting bad advice can be hard, especially if you're not that technically inclined. That's why we've collected together the least helpful examples we've seen so you know not to waste your time.

Myth 1: Your PC Is Slow Because Of Malware

While some kinds of malware can have a severe effect on a system, it's usually quite obvious if you've been infected with a program that's stealing your resources. Most malware infections actually don't want to utilise your resources too heavily, because their goal is to stay hidden for as long as possible. With the exception of botnet backdoors and cryptocurrency miners, most modern malware won't impact performance in any great way.

A properly maintained PC should be free of malware anyway, and while it doesn't cause any harm to remain vigilant and perform regular scans, the fact is that computers slow down even if you use them normally. Deciding that malware is to blame might send you on a wild goose chase at best and result in unnecessary expenses at worst!

If you want to make sure, all you have to do is run a full scan with your preferred anti-virus program. AVG Free (**free.avg.**

com) is always a good choice and will give you a fairly good impression of whether there's anything to worry about. If it doesn't find any malware, then you're probably free and don't have to worry about it being the cause of your slow system.

Myth 2: Upgrading Is The Way To A Definite Speed Increase

While we can't deny that a new processor, more RAM or a bigger hard drive has a good chance of speeding up your system as soon as it's installed, that doesn't mean it definitely will. If your hard drive speed or capacity is what's causing your system bottleneck, no amount of extra processing speed will help. Similarly, if you already have 8GB of RAM, another 8GB isn't going to make much difference in the grand scheme of things.

One of the things to remember is that slowdown isn't caused by components wearing out, so replacing them isn't going to make much of a difference, if any. Slowdown tends to come from the software and operating system. Admittedly, the problem might be that the software and operating system need access to better hardware or more resources, but that's not the same thing as your current hardware being inadequate.

If you want your upgrades to affect system speed, it's better to look for upgrades that aren't simply iterations of your current hardware. Replacing your existing Ivy Bridge processor with a better Ivy Bridge processor probably won't give you the improvements you'd get from upgrading to a Haswell CPU. No matter how high-speed or high-capacity your new hard drive is, an SSD will be faster.

If you do have a good idea of what's making your system slower than you'd like, then an upgrade can be a way of solving that problem. Just don't think that money is a magic bullet that'll solve all your problems!

Myth 3: The Registry Needs Cleaning

Perhaps the biggest and most persistent PC maintenance myth is that you need to clean out your registry and that doing so will speed up your system. While it's true that the registry can balloon in size with age, no one has ever conclusively proven that this has anything but the most tiny, barely noticeable effect on a system's overall speed.

The reality is that any slowdowns you can measure which do result from registry clutter are normally related to larger registry files becoming fragmented, rather than the size of the registry itself being the problem. Every registry entry occupies only bytes. You'd need to have thousands and thousands of unused ones to see even a tiny delay in registry access.

For some reason, these facts haven't stopped hundreds of companies making 'registry cleaning' applications, which claim to make all sorts of improvements simply by stripping the unused bits out of the registry. In reality, while they might delete some junk, there's a bigger (but still miniscule) chance that they'll do more harm than good. Deleting unused stuff from the registry has almost no effect on a system, but if the registry gets corrupted as a result of improper handling, then it's probably game over for your system.

Ultimately, the reason the registry-cleaning industry has doesn't so well isn't because it works; it's because on the surface, it seems to make sense that a less cluttered registry would mean a faster system, and the psychological power of the idea is enough to make people translate no effect into a small positive one.

Myth 4: Upgrading Windows Will Speed Up Your System

Upgrading Windows is a long, involved, often difficult process, but lots of people think it's worth the time for the speed increase that their computer gets as a result. Only you can't be sure you actually will get one from doing it.

In many situations, it's true that a clean Windows installation will give your system the refresh it needs to get back up to full speed. But again, it depends what the cause of the slowdown is. Upgrading Windows won't fix problems related to hard drive capacity and will probably make them worse. Ditto for problems caused by a lack of RAM. Every version of Windows requires more resources than the previous one, so while you might see a speed increase from having a fresh operating system it'll be illusory. You'd see just as much (if not more) of an improvement by doing a reinstall of your current operating system – which is a drastic, but almost always effective measure.

> **“Most malware infections actually don't want to utilise your resources too heavily”**

And if you really want to see a boost? Try installing a low-resource operating system, such as Linux. It's not one novices should attempt, but if you've ever managed a reinstall of Windows you've probably got the chops you need to install a copy of Linux. And whatever approach you take, just make sure you've backed up your files beforehand!

Ultimately, the process of speeding up a PC is rarely a quick or easy one. If something is being advertised as giving instant and certain benefits, it's probably trying to pull a fast one. The golden rule is that you don't tend to speed up a PC by adding something to it, whether that's hardware or software. Most speed problems come from a build-up of software and files, and in the end, you can get rid of those on your own.**mm**

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Component Watch

Looking to take your wireless network to the next level? Here you go!

Wireless AC routers are fast becoming affordable, so whether you're feeling the pinch of Wireless N network speeds or just want to be ready for the next generation of network hardware as it arrives within your connected devices, there's never been a better time to buy a Wireless AC router. So, as you would hopefully now expect from Component Watch, here's how you can do it for the best prices possible!

Deal 1: TP-Link Archer C20i
RRP: £50 / Deal Price: £31

Already one of the lowest-price Wireless AC routers you'll find, a sale discount like this one makes this piece of kit nigh-on unmissable. While AC750 speeds are far from the cutting edge, they will still mean plenty of bandwidth for everything from downloads to HD streaming – as well as USB file and print sharing. However, on the plus side of the deal there's also three internal antennae for strong, omni-directional coverage. Definitely the router you need if you're planning to upgrade from a lower standard, but want to spend as little as possible to do so.
Where to get it: Dabs (**bit.ly/1HL3hGg**)

Deal 2: Belkin F9K1113
RRP: £100 / Deal Price: £70

Most of the Belkin F9K1113's feature set is fairly standard, with four gigabit Ethernet ports, two USB 3.0 ports for detachable storage and some one-touch configuration buttons, but you're also getting the reliability and quality of the Belkin name thrown in to the bargain. If anything's likely to be a problem at this price point it's that the AC1200 standard is quite old as Wireless AC routers go, and that means it's very much a first try at getting one right. Newer and more expensive Belkins offer performance that, while not necessarily faster, is certainly less variable. With a 30% discount, though, this is a very attractive bit of kit.
Where to get it: Maplin (**bit.ly/1MmONjQ**)

Deal 3: TP-Link Archer D5
RRP: £95 / Deal Price: £79

TP-Link's kit usually sits at the lower end of quality and capability scales (and, to be fair, pricing) but the Archer D5 is a good deal whatever way you look at it. The Wireless AC with dual-band connectivity supports up to 1200Mbps, there are four gigabit LAN ports and dual USB ports to allow for storage and device sharing. As entry-level Wireless AC routers go, it's definitely worth a look.
Where to get it: Scan (**bit.ly/1dfqCrr**)

Deal 4: Buffalo AirStation 1750
RRP: £160 / Deal Price: £105

The Buffalo AirStation 1750 was the first commercially available router to support 802.11ac, and that means it's now a nice and cheap entry point to the standard. Physical connectors include four gigabit Ethernet, a WAN port and USB 2.0 port, and as you'd expect for this price point, it can share storage over the network. It might be one of the oldest wireless AC routers around, but that doesn't stop it being cutting-edge technology!
Where to get it: Dabs (**bit.ly/1dNaVIZ**)

Deal 5: Netgear D6200
RRP: £140 / Deal Price: £105

This AC1200 router is dual-band, supports ADSL2+ and has high-end features such as built-in cloud storage and media sharing. It's also got a gigabit WAN port to complement its gigabit LAN ports, future-proofing the device against faster modems further down the line. It's a strong router at any price, but a discount of this size makes it a fantastic choice.
Where to get it: Dabs (**bit.ly/1KF4ge7**)

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Silk Road Founder Jailed

Build Online Visibility With 1&1

New tools to help small businesses

Leading European web host 1&1 has launched MyWebsite 8, its award-winning software package offering a host of new tools to assist small businesses in building visibility online. With eight years of website building experience put into creating this new version, MyWebsite 8 offers an 'Online Success Centre' to make it easier for businesses to understand the process of being found online, analysing elements needed to be seen online, and guiding business owners themselves to improve their presence via a step-by-step process.

A new dashboard is better optimised than before while the Content Optimisation interface also guides users through the search engine optimisation process.

Priced from as little as £7 a month, with a 30-day trial if you're unsure about whether it's for you, MyWebsite 8's full details can be looked up at **www.1and1.co.uk.mywebsite-8**.

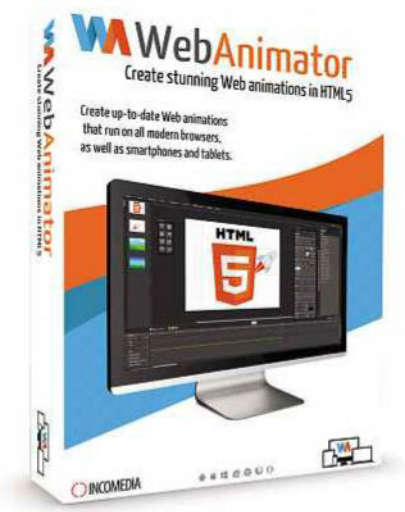
WebAnimator Adds Templates

Web animations have "never been easier"

Website creation software outfit Incomedia has released a new template collection for its WebAmimator software. Template Collection II renders the process of creating animations easier and faster thanks to a step-by-step customisation process. The collection includes a range of banners and slideshows, complete with effects, transitions and buttons.

With no prior knowledge of programming required, WebAnimator promises an intuitive and complete package for animation creation with results easily integrated into website pages or e-commerce carts.

Costwise, we're talking £45 and £65 respectively for WebAnimator and WebAnimator Plus while the new templates collection is priced at £15 over at **www.incomedia.eu**.



Life sentence for Ulbricht

A Federal court in the New York has decided that Ross Ulbricht, the man convicted as the founder of illegal marketplace Silk Road, will spend the rest of his life behind bars without any possibility of parole. Judge Katherine Forrest made the decision after Ulbricht was found guilty of charges including drug trafficking, money laundering and computer hacking.

She also ordered Ulbricht pay close to $200m in restitution; an amount related to the money he apparently earned from Silk Road during it's relatively short (around 2½ years) time in operation. The site was shut down in 2013, and Ulbricht – referred to by Forrest as "no better" than any drug dealer – arrested, after which the police found incriminating evidence on a laptop he was using. Now, despite his pleas for leniency, he is going to pay. Big time.

Lenovo Launches Laser Keyboard

Mobile with feature shown off at company conference

Chinese firm Lenovo has launched a mobile phone with a built-in laser projector, displaying a virtual keyboard or display. Displayed at the company's Tech World conference in Beijing, the laser projector in the Smart Cast phone was shown to beam images and videos onto walls and can be used to replicate the touchscreen, keyboard and also piano keys via a piano app.

Lenovo claims that the laser projector is focus-free and the phone itself comes with a kickstand to keep things steady. Will this development give mobile projectors a leg-up, or is it a false dawn? Let's all wait until this launches properly until we judge just yet.

Feel The Force...

In your living room

We're going to take a flying leap at this and assume that there are a fair few *Star Wars* fans among our readers. If that sounds like you, listen up. Bandai Namco Entertainment is releasing a home version of its arcade smash, *Star Wars Battle Pod*. Yes, if you're already a fan of the Force-themed star fighter title, and you have a lot of spare cash at your disposal, then here is a chance for you to be the envy of your friends.

If you're unfamiliar with *Battle Pod*, think *Star Wars*-themed aerial fighting and you're on the right lines. The Premium home builds of the game will come with leather seats that are synchronised to move and react to the in-game action, plus they will come in two different designs depending on which side your allegiances lie – Dark Side, or Alliance.

As for that price, we're talking around £24,000, plus shipping for starters; and if you want a premium, leather-seated version, like the one pictured, you're talking $100,000. So yes, you will need to be a) quite rich and b) slightly obsessive to actually buy one of these – but just look at it... Beautiful.

Over the last few weeks or so, we've covered various developments over at Microsoft. It seems to be working on an incredible amount of interesting new products and technologies, but in his look this week at HoloLens, Mark Pickavance is right to be wary about getting excited too soon.

Too often in recent history, Microsoft has promised great things but eventually delivered something that either no one wants or no one can afford. From the various versions of the Surface tablet to Windows 8 and more, too often it has failed to understand its audience.

That's why I, just like Mark, have my doubts about HoloLens. On paper, its innovative augmented reality technology is intriguing, but I certainly wouldn't bet against it arriving in a state that's nowhere near as good as promised and/or costing so much only Microsoft's own executives can actually afford it. I honestly hope I'm wrong, though.

Until next time,

Anthony

Editor

Meanwhile... On The Internet...

When, two issues ago, Micro Mart published a feature on region hopping (you can buy a digital version of issue 1364 via **www.micromart.co.uk/digitaleditions** and read it for yourself), one particular sentence used by our man Rob Leane, to describe the operation of a piece of free software called Hola Better Internet (**hola.org**), jumped out at us: "Unless you're willing to pay for the premium service, someone on the other side of the Atlantic is probably borrowing your IP address at the same time."

Having read plenty over the years about the things that can be attributed to people based on IP adresses (whether legitimately or otherwise), this immediately raised a massive red flag and set off a klaxon in our heads. 'Woah, I wouldn't want someone using my IP address to do whatever they wanted' would best characterise our first thoughts on the matter. Another quote from the article that made us sit up was, "According to Softonic, Hola Better Internet is the third most-downloaded browser add-on in the UK, after Facebook Messenger and AdBlock Plus." Wow, that's big time numbers right there.

However, since that article was published, it's become obvious we weren't the only people who'd been worried about the way Hola goes about its work of allowing its user to watch geo-restricted content or hide their browsing location (**tinyurl.com/MMnet66a**). Most notable among these was Fredrick Brennan, the founder of the controversial 8Chan message board, who claims the users of the service have been co-opted into a botnet that has been the source of DDoS attacks on his site (**tinyurl.com/MMnet66b**). That's not all, though: the security researchers behind **adios-hola.org** are making other allegations about the operation of the software, which they claim is "harmful to the internet as a whole and to its users in particular."

Specifically, the site breaks down its problems with the software into five key points:

1. It "allows for you to be tracked across the internet, no matter what you do".
2. It "sends traffic of strangers through your internet connection" (that was our concern).
3. It "sells access to third parties" via a service called **Luminati.io** and "doesn't care what it's used for".
4. It "lets anybody execute programs on your computer"
5. The developer is "trying to rewrite history" by quickly changing its FAQ to remove claims called out by the team (also known as 'Pulling A Whisper': **tinyurl.com/MMnet66c**).

She may be a distinctly American celebrity, a former US Olympic gold medallist who's been more recently known as a peripheral part of the Kardashian media phenomenon, but in terms of internet conversation, it's been Caitlyn Jenner's week. Her *Vanity Fair* cover (**tinyurl.com/MMnet66j**) has instigated a conversation that has seen thousands of messages and opinions bubbling to the surface; though calmer reflection has begun to take place, much of it about the language that's appropriate to describe her (**tinyurl.com/MMnet66k**) and whether the largely positive response to her gender switch represents a watershed for American culture.

It's not our place to comment on such matters, but we will note that the amount of traffic we've seen regarding 'Call Me Cait' in the last few days is, we think, inspired by the fact that *Vanity Fair* went to such great lengths to keep its exclusive a secret (**tinyurl.com/MMnet66m**). There's not much that surprises the internet these days, but Annie Leibowitz's striking cover image definitely did. Kudos for that alone.

It's all pretty serious stuff and adds up to a recommendation that users remove Hola from their computers immediately. Of course, Hola has moved into damage control mode, even conjuring up the ghost of Steve Jobs in its attempts to excuse itself (**tinyurl.com/MMnet66d**) – a move we're not sure Apple will be very happy about. Anyway, it's made attempts to block some of the problems cited, but not to the satisfaction of its accusers (**tinyurl.com/MMnet66e**).

Only time will tell if its claims that it innovated too fast and made mistakes are accepted by users or whether its offer of bug bounties restore its security creditials (**tinyurl.com/MMnet66f**). However, if you currently have Hola Better Internet installed, we heartily recommend you take a look at the Adios-hola site and make your own mind up.

Talking of rewriting history, it would seem that the powers-that-be-all-and-end-all at Twitter are not happy with the existence of the US iteration of Politwoops (**tinyurl.com/MMnet66g**), a site dedicated to logging deleted tweets by prominent politicians over there. Apparently, the site violated Twitter's latest developer T&C's, which expressly forbids such preservation (**tinyurl.com/MMnet66h**), and has since had its access to the service's API revoked. At the time of writing, though, it appears that Twitterpol has not come knocking for the UK version of the service (**www.politwoops.co.uk**).

.AVWhy? Videos For Your Eyes... Not Necessarily For Your Brain

in case you were wondering exactly when we were going to get around to talking about *Star Wars* this week, worry no longer. While everyone in the Western (gaming) World was freaking out about the *Fallout 4* trailer (admittedly impressive though it is, and we love that they stuck with The Inkspots for the music: **youtu.be/GE2BkLqMef4**) we were having a little squee over what could be the first canonical footage from the *Star Wars* universe post-*Return Of The Jedi* (**tinyurl.com/MMnet66q**). It comes in the trailer for *Star Wars: Uprising*, and – while the exact timeline placement of the *Battlefront* footage we've seen is unclear – it shows the destruction of Death Star II, as well as the erstwhile Empire's attempts to spin deny and spin the events.

Aaaaaaaand Finally...

We personally like to think that if the internet has taught us one thing – especially in the last week – it's that, if something makes you happy, just do it. To wit, we offer you the work of Australian Phil Feguson, who appears to find happiness in crocheting food hats (**tinyurl.com/MMnet66n**). In true hipster style, he's been doing it for ages, but after the BBC interviewed him (**tinyurl.com/MMnet66o**) and the internet cottoned on to his handy work, his gift is being shared with the world. Thanks, Phil!

QUICK BITS... The next version of football title FIFA will feature international women's teams for the first time

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Caption Competition

Welcome back to our weekly caption competition, where we ask you to provide the jokes for a picture of our choice. Let's see what you came up for this one:

- JayCeeDee: "The latest Check-In App came with a few surprising add-ons."
- doctoryorkie:"On the 'fly'."
- Sawboman: "I have not got the hang of these new ticketing arrangements."
- Sawboman: "I was only trying to check in, honest!"
- ...JB: "Ground control to Major Tom."
- wyliecoyoteuk: "Latest phone drone."
- The Duke: "Outcry as Ryan air replaces expensive pilots."
- EdP: "Unboxing Planeman's Birthday Present!"
- Thomas Turnbull: "Wow, these Microsoft phones with the holographic lens should fly off the shelves."
- Martin Ager: "Wow! This new phone really flies!"
- Martin Ager: "The new phone for clairvoyants - lets you communicate on different plane."
- Quentin Port: "There's nothing 'plain' about this new smartphone."
- Ian Janouskova: "I've had a phone with a USB port and even an HDMI port, but this is the first one I've had with an airport."
- Richard Westcott: "I knew this phone would take off."

Thanks to everyone who enterered this week, and congratulations to our winner, JayCeeDee, who came up with "It's really cool – it's the new iPhone Air."

To enter this week, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and say something funny (but not too rude) about the picture below or email us via **caption@micromart.co.uk**.

Windows 10 Release Date Confirmed by Microsoft

Save the date, people

July 29th is going to be the day that Microsoft releases Windows 10 for both PCs and tablets. The globally coordinated release will also be rolled out on as a free update for current Windows 7 and 8.1 users. There's no rush, though, as the company is offering a year's grace period from that day within which people can take advantage of the offer.

There's no word on Windows 10 Mobile as yet, though.

Google Announces Next Android OS

Conference highlights Android M's features

Google's mobile Android platform was highlighted at the company's I/O conference in the form of a developer preview of Android M. The new Android iteration promises to give greater privacy controls with users able to control an app's permissions. Fingerprint technology could be used for ID checks on web purchases and be used in association with Android Pay, allowing devices to be used to pay for purchases rather than payment cards.

Android M will also aim to extend device battery life, via its Doze feature – which regulates background activity as a trade-off for keeping some juice spare.

Google didn't stop with Android M either, it also showcased a Photos app with unlimited free clioud backup, an update to its Google Cardboard VR project and more.

'With moments of real genius, some of his poems will last as long as poetry is read.'

– Benjamin Zephaniah

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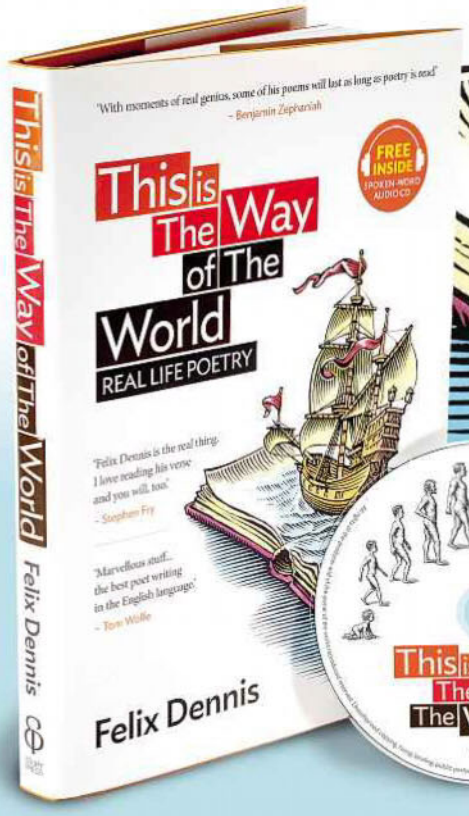


A book of poems for those who don't read poetry (as well as for those who do!)

A collection of 'real life' poems by Felix Dennis, one of Britain's best-loved poets, charting life's course from infant to endings with illustrations by Bill Sanderson.

www.felixdennis.com contains many poems, published and unpublished, as well as a library of sound recordings and video footage of Felix Dennis's verse and poetry tours.

EBURY PRESS

Snippets!

#WordOfTheYear

Radio 2 has recently run its annual 500 Words short story competition and an analysis of the entries by Oxford University Press has revealed that the children's word of the year is... the hashtag symbol. The Guardian reports that analysis of the 120,000-plus entries pointed to the popularity of the word, but also suggested that children are using more vocabulary in their writing.

Digital Tops Cash

For the first time in the UK, digital payment for purchases has outweighed those made with notes and coins. This is according to research from the UK payments industry body, the Payments Council, which also noted that cash payments by consumer, business and financial organisations fell to 48% last year. The other 52% is made up from cards, phone transactions, web and other non-cash forms.

Cash actually remains the single most popular method of paying for things among consumers alone (all those cheeky chocolate bars and packets of crisps add up, y'know), with debit cards coming in second.

Sir Tim's Spy Warning

Sir Tim Berners-Lee has called out the government over surveillance plans that would s allow for tracking of your Internet and social media usage. He certainly doesn't seem very happy; quoted in *The Guardian*, he warned: "The discussion of increased monitoring powers is something which is a red flag." Worried that it may be rushed into law, he added "It's really important that legislation is left out for a seriously long comment period."

Bluetooth Wearable From Japan

Works with various social media apps

Seeing as wearables are quite the gadgets of the moment, it seems only fitting that we should point you in the direction of the Kisai Link, a bluetooth wearable from Tokyoflash Japan.

The Kisai Link comes in 28 different styles, including this leather bracelet pictured, and at under 10 grams it's light and you'll hardly know that it's there under your wrist. Receiving notifications from a range of social media apps, including Facebook, Facebook Messenger, Skype, WeChat and Twitter, notifications can be customised. The Kisai Link will also help to find a misplaced phone by calling it for you, plus vibrating whenever you leave your phone behind by mistake.

Rechargeable in 90 minutes and up to 5 days battery life, this will cost you around £50 from **www.tokyoflash.com**.

Nintendo Truck Stolen

Splatoon stock theft

News reports have said that a lorry transporting special editions of title *Splatoon* from Nintendo's warehouse to retailer GAME has been stolen. Yes, the actual lorry was nicked and anyone who pre-ordered the special edition of the title, which was to come with an Amiibo figurine, from the store won't get it at launch time. Reportedly, they can instead get a tenner off the standard version of the game or just cancel altogether.

This wasn't Nintendo's fault, naturally, but it is bad news for the company nonetheless. Save a thought for those eager gamers who are missing

ATX Case From Phanteks

So, it's an ATX chassis from... oh, you get the idea

You ask for it, we build it; that's the message coming from Phanteks with the release of an ATX version of its Enthoo EVOLV case, available now via **www.overclockers.co.uk**. The EVOLV ATX mid-tower chassis features a quick-release side panel system, new HDD mounting system and an aluminum exterior. Equipped with three 140mm fans, 53mm cable management space, Phanteks velcro ties and PWM fan hub, this chassis is watercooling-ready.

Have a look for yourself at the web address mentioned above, where you'll no-doubt find all the info you'll need.

QUICK BITS... **If you're quick, you can register your interest in the App-a-thon Guinness World**

Google Maps Goes Offline

No data required

Among the slew of announcements at the recent I/O conference, Google has said that Google Maps will soon have its search and navigation features made available offline. That means there will be no reliance on wi-fi or your mobile data in order to search and find your way to your destination, and this should prove an effective answer to the thorny problem of data deadspots.

Should this happen, this will be a genuinely game-changing move from Google, allowing users to search and find their way around the world, regardless of connectivity or service provision.

Twitch Ditches Adult Games

No Adult-only titles allowed from now on

Video games streaming service Twitch has tweaked its rules of conduct to ditch Adults Only games. In a blog post, the site told users that "Simply put, AO games are not welcome on Twitch". This is a harder line than its previous rules on the matter and firmly clarifies things for all concerned. Anyone breaking the rules will bag a temporary suspension.

It seems that recent release *Hatred* may have, in part, prompted the announcement as it's one of three games listed as being banned under this policy. If Adults Only titles have been reworked with a Mature rating, then they are allowed, but only the Mature version.

Drone Helicopter Delivers Cash For Bystanders

No reason given

People walking around a park in Grand Rapids, Michigan were recently privy to a drone helicopter dropping money from the sky. This chopper was seen circling over the park before then releasing a bunch of one-dollar bills. According to a local report "Once people realised the cash was real, they swarmed to pick it up" with children and adults alike rushing for a freebie.

Local police were far from happy, though, with a Sergeant quoted "The problem is that it could become a safety hazard for the kids or the youths that are running to get to the money –they could be crossing the roadway and inadvertently be struck by a car or something like that."

Killjoys.

At the time of writing, no-one had admitted to being responsible for the money drop.

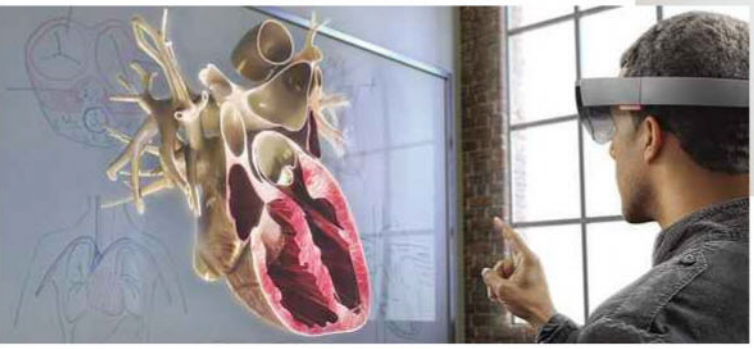
Apple 1 Dumped In Garage Clean-Out

$100,000 waiting for donator

All of us store junk in our garages, within which you may come across the odd gem of a find. It's highly unlikely that you'd chance upon an Apple 1 computer, however. Even less likely is a situation in which you'd drop off such a rare find at a recycling firm, without any request for payment.

And so we bring you the news of an anonymous lady who has become the talk of Silicon Valley-based recycling firm CleanBay Area when she donated a stock of old electronic bits from her garage following the death of her husband. The old boxes turned out to house an Apple 1 computer, fetching $200,000 for the firm at a private auction.

The firm is now offering half the fund – $100,000 – to the elderly woman, should she return to the recycling centre and make herself known. We really hope she gets the message.



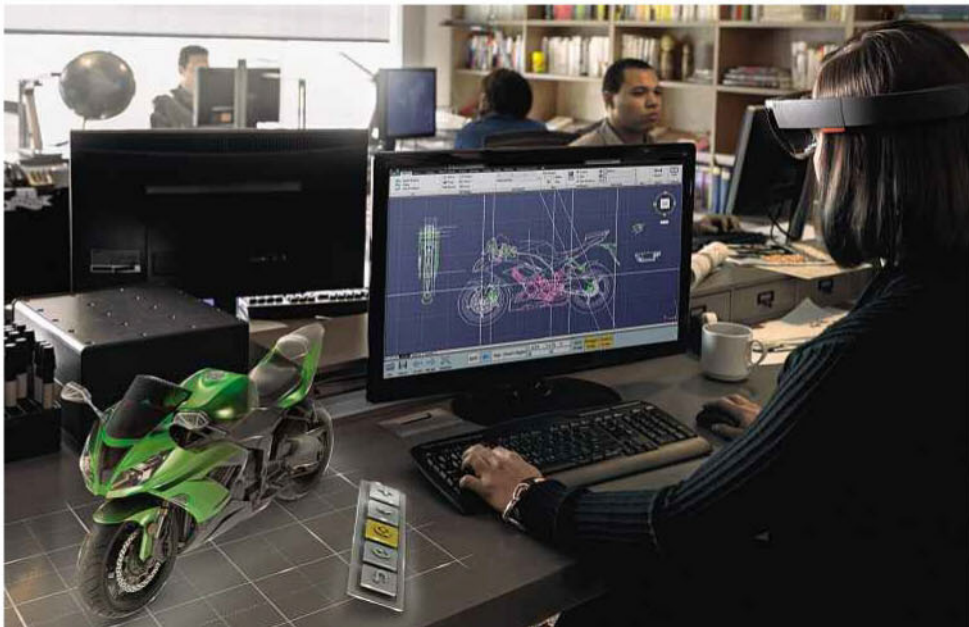
Microsoft Hololens: Is The Excitement Real Or Virtual?

Mark Pickavance examines what we know about Microsoft HoloLens and questions where it fits in among the many competing devices

The words 'Revolutionary' and 'Microsoft' haven't made it into the same sentence for some time, but the arrival last year of something quite unexpected from the Redmond-based company did find many combining them.

After the retreat that Kinect ultimately became, few were expecting Microsoft to launch something quite so radical again anytime soon. Yet the appearance of HoloLens provided an interesting counterpoint to what Google and others are doing in the virtual reality marketplace.

So what is this new device, and should we get excited about it?



Project Baraboo

According to various sources, the concept of the HoloLens was first pitched at exactly the same meeting when the Kinect was presented. In fact, they're a fork of a single original idea, about making computers and games consoles spatially aware.

Three years later, in 2010, Microsoft started working in earnest on what became 'Project Baraboo', a system of holographic lenses designed to deliver an augmented reality OS to the wearer through a headset. Interaction with the computing power in the headset would be through gesture, eye tracking and voice. Though, Microsoft hasn't ruled out the use of wireless keyboards, mice or other controllers.

From the outset the intention was to make it ultimately self-contained and, unlike the Kinect, independent of an external computing platform.

It took five years for Microsoft to have technology it felt comfortable enough to reveal publicly, which it did at the Windows 10 announcement on 21st January this year.

The versions of the HoloLens headset shown to the press after that announcement weren't the finished item and required lots of extra equipment connected to work. Subsequently at the Microsoft Build conference in May, a much more polished version of the hardware was shown that didn't require the users to mount batteries and other paraphernalia to their bodies.

While Microsoft was seemingly happy to demonstrate its equipment to a select few on both occasions, it seemed less keen to have the experience filmed or provide any great details about the hardware and capabilities of this device. That is probably because the hardware development team is at a critical point where they're trying to finalise the technology, so not everything is set in stone.

However, based on the experiences of those lucky enough to try it, here is what we do know about Microsoft's virtual reality experience.

HoloLens Revealed

At the heart of the headset is a Windows 10 PC, one that's small enough to fit inside and be powered by batteries. While neither the CPU nor GPU have been discussed, given what calculations need to be performed for the system to work they must be reasonably powerful.

To avoid exhausting the batteries very quickly (although we still have no idea of operating life), Microsoft has designed some specialist support chips, including a holographic processing unit (HPU). This

"After the retreat that Kinect ultimately became, few were expecting Microsoft to launch something quite so radical again anytime soon"

is tuned to handle the maths involved in converting the piles of data coming from the many sensors on board into the visuals that the wearer experiences. These sensors include an accelerometer, gyroscope, magnetometer, depth camera, photographic camera and a microphone array. In many respects, this is a head-mounted Kinect, of sorts.

3D stereoscopic images created by the system are projected onto the inside of the lens, and these are positioned correctly by means of a calibration process. Each user must go through calibration to compute the exact distance between the pupils of each eye, so the stereo visuals are aligned with real-world objects. By using the sensor data, objects can also be made to interact with the real environment, and the user can direct with them using their hands, eye or voice commands.

The number of calculations needed to make this work believably is disturbingly high. HoloLens chief inventor Alex Kipman is quoted as saying that the HPU processes "terabytes of information" from the HoloLens's sensors in real time to achieve the effect.

That this is possible at all is impressive, but as HoloLens is a wireless device that recharges via USB, the achievement seems almost magical.

In many respects, this is very like some other VR technology we've been seeing in recent years, including Oculus Rift. But where HoloLens diverges is that instead of supplanting reality entirely, it chooses instead to overlay things on the real world.

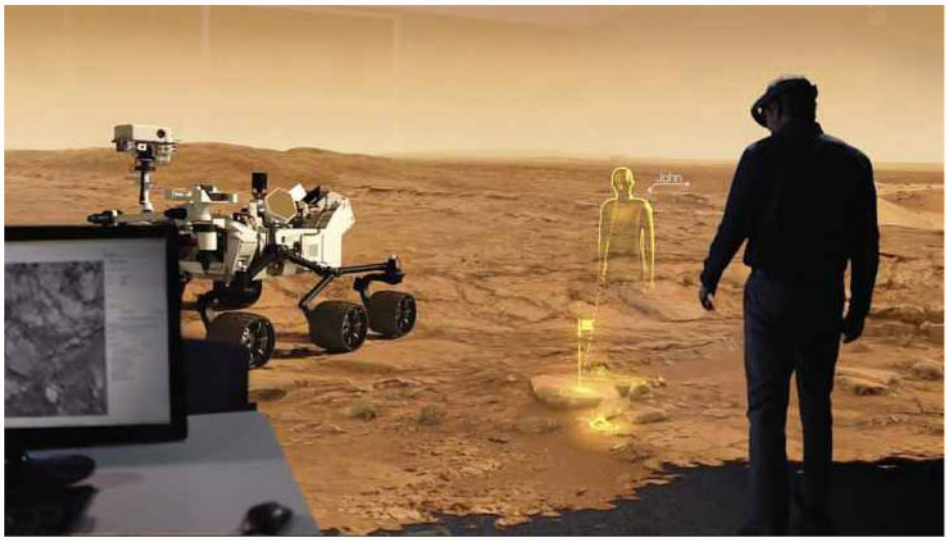
While this solution doesn't entirely meet the definition of 'virtual reality', what it does is avoid some of the very obvious pitfalls that those solutions have encountered, like spatially induced headaches and nausea.

When the HoloLens gets much closer to actually being available, hopefully we'll get more details about the computing power, sensors, battery life and cost.

At this time, we have no hard information on any of those things or even when the headset will be able to be ordered or bought. What we do know is that Nasa has had it for a while, and it seems very impressed with what can be achieved using it.

Walking On Mars

One of the first users of HoloLens was Nasa's Jet Propulsion Laboratory in Pasadena, California, which developed a software tool called 'OnSight', for working with its Mars Rovers. By using the headsets in conjunction with image data they've previously sourced from the rovers, mission



specialists can walk around the surrounding terrain and decide where to move the vehicle next and by what route.

What's fascinating about their solution is that they realised early on that if the Mars graphics overlaid reality, then they'd need to create markers for where other team members are located in the work area or risk bumping into them.

Jeff Norris, JPL's OnSight project manager, explained why the HoloLens was critical to the solution: "Previously, our Mars explorers have been stuck on one side of a computer screen. This tool gives them the ability to explore the rover's surroundings much as an Earth geologist would do field work here on our planet."

While all the work with HoloLens up to this point has been research, it's expected that later this year OnSight will be used in anger on forthcoming Curiosity missions. And future applications may include Mars 2020 rover mission operations and in support of Nasa's journey to Mars. If successful, OnSight might be seen as a planning and prototyping tool that allows a mission to be conducted on a much more interactive basis than Nasa has previously been allowed to work.

But HoloLens developers aren't all involved in hard core scientific research. Some are just interested in the interactive play potential that augmented reality offers.

Holobuilder And HoloStudio

Microsoft's recent purchase of *Minecraft* creator Mojang is seen in an entirely different light when viewed in the context of what HoloLens can do.

Microsoft already has a prototype clone of *Minecraft* running on the HoloLens platform, called HoloBuilder. Using this application it's possible to create *Minecraft* structures in your home that either conform to the space and surfaces already there or that totally subvert them. Worlds can be viewed through virtual windows and holes, presenting scenery that extends above and below your room, as well as beyond solid walls.

While Microsoft has yet officially confirm that Minecraft is coming to HoloLens, given how well the demo was received by those who tested it, this might well be one of the critical default software components that it will use to generate sales.

A less compelling, but equally imaginative demo tool is HoloStudio. This software is focused on providing a means to sculpt 3D objects inside the environment offered by HoloLens. The images and video of HoloStudio reveal something that's reminiscent of the old PC classic TrueSpace, where you can dynamically scale and distort primitive shapes to make more complex compound objects.

That you have the freedom to move your viewpoint easily rather than needing multiple fixed viewpoints could make for very rapid prototyping, even if professional modellers might want finer control than this method currently enjoys.

As an interesting aside to HoloStudio, Microsoft has created an interface within the tool that allows the finished models to be outputted on a 3D printer, allowing the designer to progress from virtual 3D to generating real objects seamlessly.

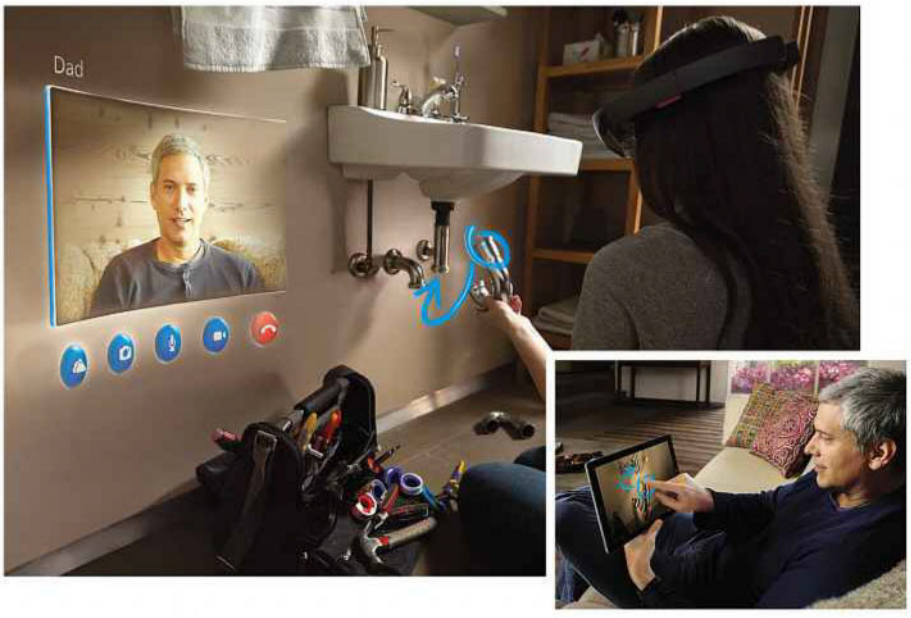
Nobody working a professional CAD station to create film effects models or structural engineering is likely to drop what they're doing and switch to HoloStudio soon, but as a proof of concept, it seems an interesting development that could evolve into something more practical.

Along with these tools, Microsoft has also shown a wider selection of conceptual work, including some educational apps for teaching biology, architectural engineering, a virtual movie studio and even a holographic version of Skype.

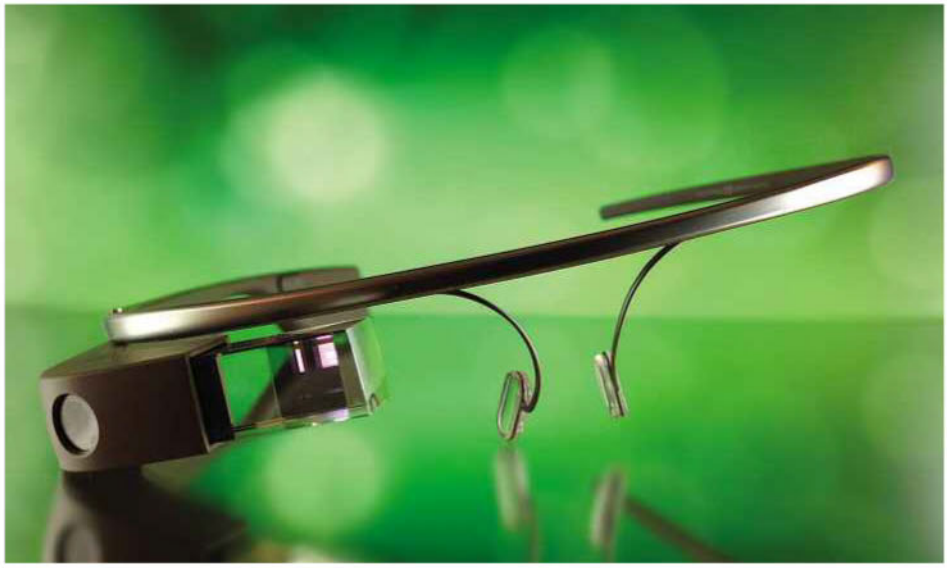
Clearly, HoloLens isn't being tailored specifically for serious or entertainment use but for as wide an application as possible. It will be the software that ultimately sells this product and the work of developers that will keep Microsoft's customers happy in the future.

Competing Products

A bit like 3D movies, VR has gone through a number of cycles, where everyone is told it's the 'next big thing' only for it to fall flat on its virtual face.



Oculus Rift by Oculus VR: pure virtual reality for those who really want to get away from the real world



For the moment, Google has withdrawn Glass to rethink what it's trying to achieve for augmented reality users

Infamously, Nintendo launched the Virtual Boy on an unsuspecting public in 1995, only to discontinue it the following year, after a generally poor reception and disappointing sales. Reviewers complained the headset made them feel decidedly unwell, to the point of vomiting.

The ideas of both full VR, as in the Virtual Boy, and augmented reality solutions have gained traction, both in popular culture and with military hardware designers, but the re-emergence of this technology into the realms of retail product has been much slower. However, in the past few years, two major branded products have been propelling forward the idea that we all might join the few who enjoy VR on a regular basis: Google Glass and Oculus Rift.

The Google Glass project has never been a commercial product, yet Google sold a fair number of 'Glass Explorer' headsets to those interested in either experiencing or developing for this unfinished product.

In terms of the VT experience, Glass was designed to provide a hands free means to interact with Google services, while providing some minor degree of augmented reality. When it was first released, many thought that Google had stolen a march on its competitors, like Apple, and soon we'd all be wearing these curious glasses that you can talk to and that provide useful information in the corner of your eye.

Unfortunately, life is rarely that simple. Almost at launch, some people expressed privacy concerns about how Glass could be used to record others. Cinema chains also entirely misunderstood their purpose and assumed that those wearing them were trying to pirate movies.

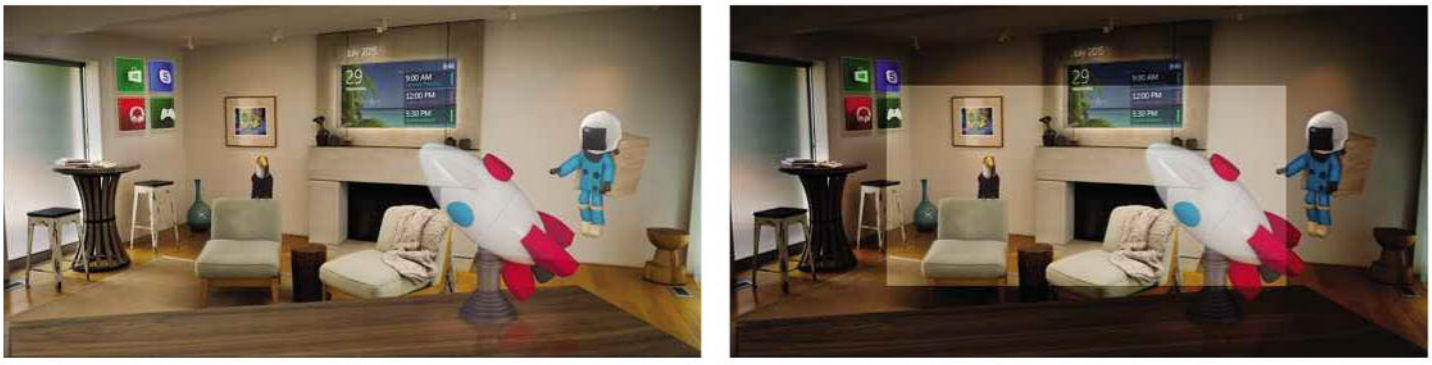
Social issues, safety concerns and the quite limited functionality all pushed Google away from a commercial launch and in the direction of a rethink.

At this time, you can no longer buy the Explorer edition, and Google doesn't have a timescale as to when a new Glass solution will be beta tested or commercially available.

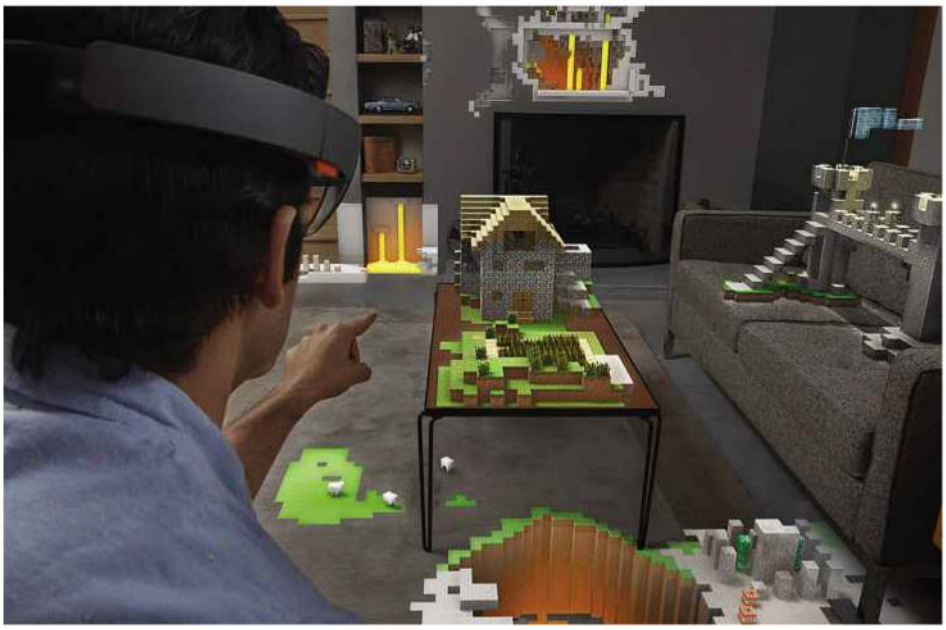
If Google Glass is at one end of the spectrum, then the other is Oculus Rift, developed by Oculus VR. This is a full VR headset that requires a connected PC to perform the 3D calculations necessary to drive the visuals. Originally funded by a Kickstarter campaign, the project has been driven by fans of FPS games, who wanted a much more immersive experience.

The headset provides 90 degrees horizontal and 110 degrees vertical stereoscopic 3D perspective, and in the

"HoloLens chief inventor Alex Kipman is quoted as saying that the HPU processes "terabytes of information" from the HoloLens's sensors in real time"



How Microsoft likes to promote HoloLens versus what you might actually see using one. If this point isn't addressed, it could be a dealbreaker for many



The HoloBuilder demonstration shows how Minecraft could be much more like virtual Lego when combined with HoloLens. But less painful to step on, hopefully

games that have been modified to use it so far you can actually look down and see your hands holding a weapon.

After several prototypes and numerous demonstrations, a consumer version with spatial audio, higher resolutions displays, enhanced head tracking and even a wireless mode is promised in Q1 2016. Pre-ordering will begin later this year, when we also get to find out how much Oculus Rift will cost.

Being a full VR solution, Oculus Rift's biggest challenge has been to reduce the nausea that the immersive images can generate. The reason they do this in many people is that the head positioning sensors drift out of sync with the real positions, making the images appear to lag the motion sensors in the user's own head. This is the same problem as those who experience seasickness get, where their internal sensors tell them one thing, but their eyes say something subtly different. Much work at Oculus VR has gone into making the tracking lag so low that people won't be violently sick after extended use.

The second developer kit model called DK2 was sent to over 100,000 users, so Oculus VR has a substantial amount of feedback about what works well and those areas that need addressing.

The questions that haven't yet been answered about Oculus Rift are how much it's going to cost and whether it will arrive before or after HoloLens.

Microsoft would undoubtedly like it to arrive after, but that isn't its only concern, because the reaction to the Build 2015 demos has been mixed, at best.

The HoloLens Cracked

Over the past few years, I've given various TV makers a kicking in these very pages for their portrayal of 3D TV. Where it really annoys me is that they show 3D imagery breaking the frame of the panel, in a way that it's impossible for the images to do.

It isn't a mistake on their part, as they know full well that 3D doesn't work like that. They're intentionally misleading those who have never experienced it, and amazingly in this instance, those that regulate advertising appeared to notionally allow it.

The excuse (and I've heard it first hand) is that it's difficult to use a 2D image to convey 3D without doing these things. How else can they get around this limitation? It's a tough one, but showing it doing something it patently can't do seems the worst possible solution to the problem.

But sadly, in the Build presentations, Microsoft actually went further than those indiscretions, by presenting a version of the HoloLens experience that wasn't the one users of the prototype equipment got.

I wasn't at BUILD, but based on what those journalists who did attend said, the presentation was at best "misleading" and at worst, as one attendee put it, "a lie".

The point of contention was the field of view that those using the device would experience and how it differed significantly from the version shown in January and used by Nasa.

In the earlier version, the field of view was sufficiently wide that wearers described the experience as "immersive", to the

Making 3D objects looks fun with a virtual reality interface, but could this replace conventional CAD?

extent that in the part of the demo where they used the OnSight software, they actually felt like they were walking around on Mars.

Unfortunately, the Build users got an entirely different experience, as the field of view had been drastically pared down, to the point where everything seemed viewed through a virtual letterbox.

This was so different that a number of journalists who had attended the original demo thought their HoloLens equipment was initially broken, until Microsoft staff convinced them that it was working as intended. Based on the descriptions provided by a number of attendees, the field of view is only about 40 degrees horizontally and even less vertically.

The typical field of view of an average human adult is about 180 degrees horizontally and 135 degrees vertically. Even if you discount those parts of our vision that are considered peripheral or even fully stereoscopic (just 114 degrees), the area covered by HoloLens isn't comparable. No explanation of the discrepancy between this and the earlier prototype was provided by Microsoft, and none has been forthcoming since.

What irked many is that in the stage presentation, Microsoft said that it had mounted a mounted a HoloLens on a camera so those attending might understand what the wearer was experiencing. However, that viewpoint had no small viewport, so it wasn't at all representative of the HoloLens experience.

One attendee, Paul Thurott (**thurott.com**), commented that using the Build version of HoloLens he could only see objects directly in front of him. And in the stage demonstration, when the presenter asks for a video to follow him, he'd be totally unaware if it was following, until he turned back to look at it.

As you might expect, lots of journalists

The Virtual Boy. We've been here before with virtual reality, and the results weren't pretty or pleasant

HoloLens has been added to the range of devices that will run Windows 10, when it's available

weren't happy with the impressions that the stage presentation gave and how they didn't gel with those experiences they had with the real equipment, leaving something of a cloud over HoloLens.

As we still don't have a launch timetable, these things might be addressed before HoloLens is commercially available, but given Microsoft's lack of transparency on the subject, they might not.

Final Thoughts

I so want to be entirely wrong about HoloLens, because conceptually I can see the augmented reality path as potentially a much more fruitful direction than the pure VR one.

It negates the motion sickness issues and allows you to interact with the real environment around you, in addition to the virtual one.

I can imagine a working environment where I don't generally use monitors, where I can spread my web pages and documents around me and interact with them in a virtual space. It's the future depicted by *Minority Report*, but actually better in some respects and tons more fun.

But undeniably, there was an issue with the original prototype platform either in battery life or cost, which caused Microsoft to step back from its original concept in their its demonstration versions.

It's also very disconcerting that the camera hooked up to the technology at the Build presentation isn't remotely delivering the graphics that testers experienced hours later. There's a horrible mismatch between the marketing dream and the reality, or virtual reality in this case, which Microsoft appears in no great hurry to address. And based on technology companies in general, and Microsoft in particular, if they don't want to talk about something, it's for commercial reasons.

If the finished HoloLens that Microsoft actually launches is like the one it showed at Build, a lot fewer people will be interested in having one, I suspect.

The problem is that nerds these days are more social creatures, so given the information void that's been created, there are plenty of people on the internet ready to fill that space and trash HoloLens before a finished product is ready for release. That's a little depressing, but the way that expectations have been dampened, it was inevitable given the relative drought of factual information about this project.

Until the finished product arrives with a horribly small FOV, costing a fortune and with software that's very limited, then we probably shouldn't judge it. Mind you, if it does arrive and Microsoft has somehow managed to snatch defeat from the jaws of victory once more, then it will deservedly get both barrels. If that's not the case, we can just put this down to a corporation with hundreds of thousands of employees but not a single one who can communicate coherently.

Managing expectations is always part of any technology product's launch, and at this point Microsoft seems content for many to believe this won't be the product that makes the Microsoft brand exciting again. However, it could all be misdirection.

In that case, if HoloLens does what the original demo version did and isn't stupidly expensive (like the Surface Pro 3), then I'll be at the head of the queue to buy one, almost regardless of what it costs.

Based on past experience, though, I'm confident that my cash is likely to remain unsquandered in the coming year – or at least until HoloLens 2.0. **mm**

The Steam Controller is looking to become the best controller available for the PC

2015 Gaming Hardware

The Nvidia Shield may well end up being the only Android box you'll need in your living room

David Hayward checks out what gaming hardware we can expect for the remainder of the year

When 2015 started, we were tantalised with some pretty impressive-looking gaming hardware. Devices and technologies were promised, and we lapped up every word while eagerly awaiting the arrival of the return of virtual reality and the much talked about Steam Machines.

We're now halfway through the year, which gives a pretty clear view as to what to expect for the remaining half. What gaming hardware can we expect to have in our possession by the end of 2015?

We pondered this question for a while, because the two big consoles are pretty much static for the time being, unless Microsoft sneakily releases a slimmed down Xbox One before the Christmas rush, so there's not a lot of room for core console

The Nvidia Titan X, a monster of a graphics card

gaming hardware – although peripherals are still in with a chance. The big money, it seems, is on PC gaming hardware, with plenty of exciting new products heading our way in 2015.

Nvidia

The big name on the graphics card front is undoubtedly the behemoth known as the Nvidia GeForce GTX Titan X.

The Titan range of extreme graphics cards have been shown off at various technology shows since 2013, but they've so far failed to gain a significant foothold in the general consumer market. This is mostly because they cost an arm and leg and were overshadowed by the more consumer-friendly GTX 9 cards, which were only slightly behind in terms of performance.

The Titan X, though, is a different beast altogether. It's the most powerful single GPU card on the market at the moment, with a whopping 3072 CUDA cores, 12GB of memory, 7GHz GDDR5 memory clock and a boost core clock of 1075MHz. It has a new Maxwell 2 GPU, the GM200, and you'll need a small nuclear reactor to power the 250W TDP required to keep this thing ticking over.

The cost, as you would expect, is pretty high. Overclockers has its version available for £869.99, and you can expect to see more tweaked versions fetching well over the thousand pound mark.

Nevertheless, if it's the ultimate gaming PC you're building, and you also happen to be an investment banker with near unlimited funds at hand, then by equipping your machine with one of these, you'll be able to shift the pixels around at 4K without any performance problems.

> **"The big name on the graphics card front is undoubtedly the behemoth known as the Nvidia GeForce GTX Titan X"**

AMD

AMD is naturally hot on the heels of Nvidia, and sometime in late June it'll be showcasing the much anticipated Radeon R9 380X to the gaming collective.

The specifications are sketchy at the moment, with various websites listing different specs to each other. What we can determine at best is that the 380x will have a Fiji-based GPU with 4096MB of GDDR5 memory and a boost clock speed of 1050MHz.

It's a hungry card as well, with a TDP of 300W, but there are rumours that AMD will be using its new High Bandwidth Memory technology to push the bandwidth to an almost unbelievable 640GB/s.

The Steam Link could be a cost effective solution to streaming your gaming

SteamVR is set to immerse in a HD world of interactive gaming

Steam Machines are go and will become more widely spread as the year draws to a close

When the R9 380X will be available to buy is not known at the time of writing, but most pundits have an October date in mind. There's no word on the pricing yet either. One thing's for certain, though: the gaming PC of 2016 will have some pretty impressive visuals.

Steam Machines

The Steam Machine from Valve has been a long time coming, almost to the point of it being declared vapourware. However, you can lay your hands on the Alienware Alpha now, but you'll have to wait for November until you can get your hands on the Steam Controller.

A handful of Steam Machines began to appear in April, and they're gathering pace as the November launch date rapidly approaches. However, the main draw isn't so much the machine itself, but rather a companion box called the Steam Link.

The Steam Link will allow you to bring your existing Steam library to your living room by streaming the content from your gaming PC across your home network. It has been designed for simplicity, in that you plug it in and it'll scour your network for any PC running the Steam client. All you'll need to do then is connect your Steam Controller and away you go.

The Steam Link is set to cost around £35, which doesn't seem too bad. There are already home-made solutions available, and there's even a way to stream games from your PC to a TV through a Raspberry Pi 2, using the Nvidia Command Centre. Still, having an official Steam Link could fix some of the glitches and bottlenecks you're likely to come across with a DIY solution.

Steam Controller

The aforementioned Steam Controller is fast becoming the holy grail of the gaming world. It has been delayed numerous times, redesigned and hidden behind a veil of secrecy but, as we mentioned, November will see gamers scrambling to get their mitts on this long-awaited piece of technology.

It's hard to believe that the Steam Controller was announced just over two years ago. It's been a long time coming, and from what we've seen so far, it looks like it was well worth the wait.

The controller features a single stick with a pair of haptic feedback enabled touchpads. There's also a classic four-button array and a Steam logo centre button with an extra two, smaller buttons either side.

In addition to that, there are also a pair of triggers, bumper buttons and another set of buttons located in the extended hand grips – or wings, if you prefer.

The performance of the controller is said to be magnificent and an extremely fluid way of playing. You can increase the sensitivity to a high degree and, according to rumours, create a set of custom macros for the buttons depending on the game being played.

> **“The aforementioned Steam Controller is fast becoming the holy grail of the gaming world”**

Of course, we'll have to wait and see if all this is true or not. As for pricing, most experts put the final cost at around £50, but again this is purely guesswork, as everything may change when the release date nears.

Virtual Reality

Like it or not, VR is back, and this time it means business. We've already had a look at an early Oculus Rift design in Micro Mart, and we were suitably impressed with what the world of VR has to offer. But it would seem that the Oculus Rift isn't the only headset on the cards for a 2015 release. In fact, the OR may not even make it for a 2015 release.

The HTC Vive is the new kid on the block. This joint venture between Valve and HTC could very well put the OR in its place when the two are finally put head to head. SteamVR, which is the virtual reality system that the Vive is part of, has been designed to allow the user to move around in their current surroundings free from wires – or at least it's intended to be; for the time being, it's still physically wired up to a PC.

There are a total of 37 sensors implanted into the headset that are interconnected to a pair of wireless sensors, which will be located in the corners of the room the user is standing in. This creates a virtual space for the user, so any games and so on can take advantage of the interior of the room to best effect. In theory, this could lead to the user hiding behind their sofa, which in their view could be a burnt-out car, and popping up to return fire to a virtual nemesis on the other side of the room.

However, if the specifications are to be believed, the AMD Radeon R9 308X could become the world's most powerful graphics card

According to Valve, the SteamVR package will also come with a pair of wireless controllers that feature trigger touchpads and various buttons, which can relate to the VR world as guns and so on. All of these interact with the headset and the sensors in the corners of the rooms, so you'll be able to look down and 'see' your hands and where they are in relation to the real world and the computer-generated world.

> **"This could lead to the user hiding behind their sofa, which in their view could be a burnt-out car, and popping up to return fire to a virtual nemesis on the other side of the room"**

The realism produced by the SteamVR is said to be incredible, enough to draw gasps from the users who have already tested the set in closed door sessions. This is thanks to the two screens that are powering the SteamVR, with each producing a 1200 x 1080 resolution image for each eye and a 90Hz refresh rate. This eliminates one of the most common issues with the current development VR headsets: nausea or sea sickness.

The price of the entire package is speculative at present, but it's certainly not going to be cheap considering the headset, wireless controllers and wireless sensors that come with it. Expect something in the region of £300 to £400.

Nvidia Shield

We already have the Nvidia Shield in the form of the tablet and controller that can hook up to your TV or be used on the go together, but this year we should be getting the missing piece of the jigsaw in the form of a new Shield console.

The new Shield has been designed to be the entertainment hub of your living room. This is an Android-driven box that's pretty similar in design to a PS4, only thinner. Inside there's an Nvidia Tegra X1 processor, a 256-core Maxwell GPU (the younger sibling of the GPU found in the Titan X), 3GB of RAM and 16GB of flash storage, which can be boosted by inserting a micro-SD card. Connectivity is good too, with a pair of USB 3.0 ports, micro-USB 2.0, Ethernet, HDMI, 802.11 a/c dual band wi-fi, Bluetooth and the micro-SD card port.

This all sounds rather interesting, and to cap it all, there's support for 4K content playback, Dolby 7.1 and a ton of games that will be available via Steam upon the Shield's release. Furthermore, the Shield comes with a Bluetooth remote, which has voice search and a headphone socket, and you can also control everything from the Shield controller, should you wish.

The Nvidia Shield looks great and should be available to buy for Christmas for the predicted price of around £130.

More Gaming Potential

Needless to say, these are just a handful of snippets. There are countless other examples of intriguing gaming technology just around the corner, but we just don't have the space to fit them all in here.

Rest assured, though, if you're a gamer, then 2015 is looking to be a very good year for you. **mm**

Other Mentions

There are plenty of other gaming technologies coming throughout 2015, so here are a few more to keep an eye out for in the months ahead.

Project Morpheus

Sony has put quite a lot of folding stuff into its VR project. The design has been spruced up, apparently, and every aspect of the headset has had many improvements and enhancements. We'll have to wait for early 2016, though, to see exactly how it will fare, but we're optimistic.

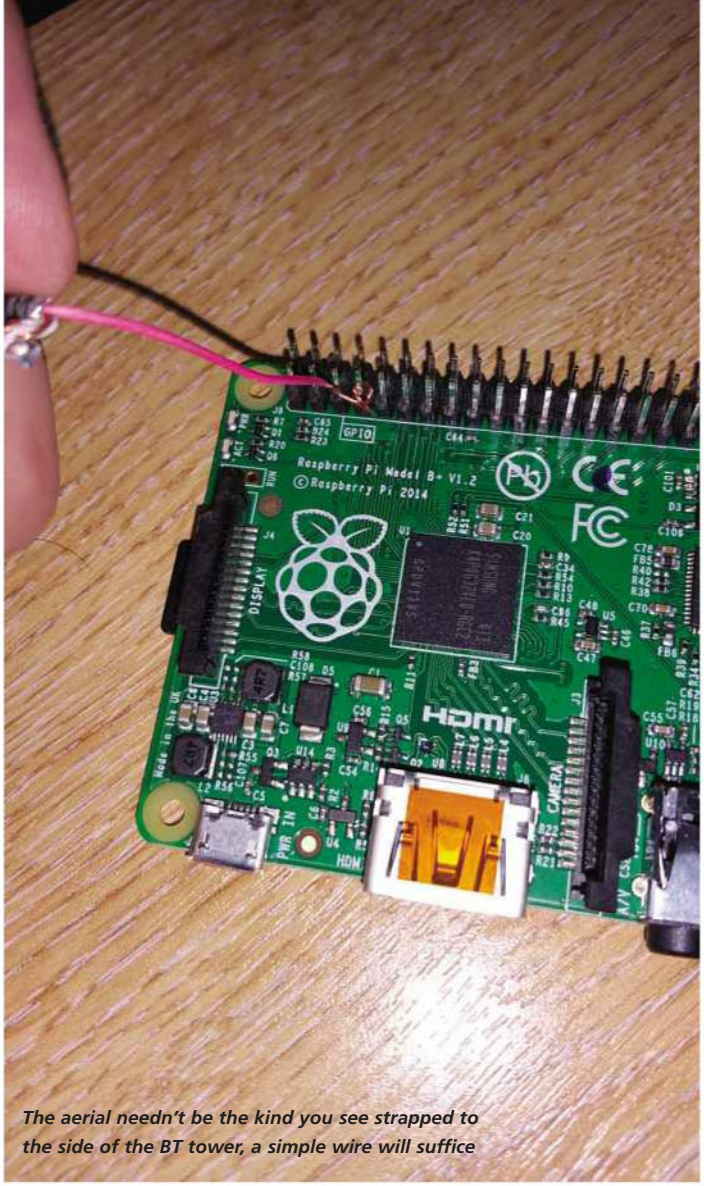
Oculus Rift

The Oculus Rift has gone through the rumour mill and back out the other side in recent months, but we're assured that the final version will make an appearance by early 2016, with a much beefed-up resolution and a lack of motion sickness.

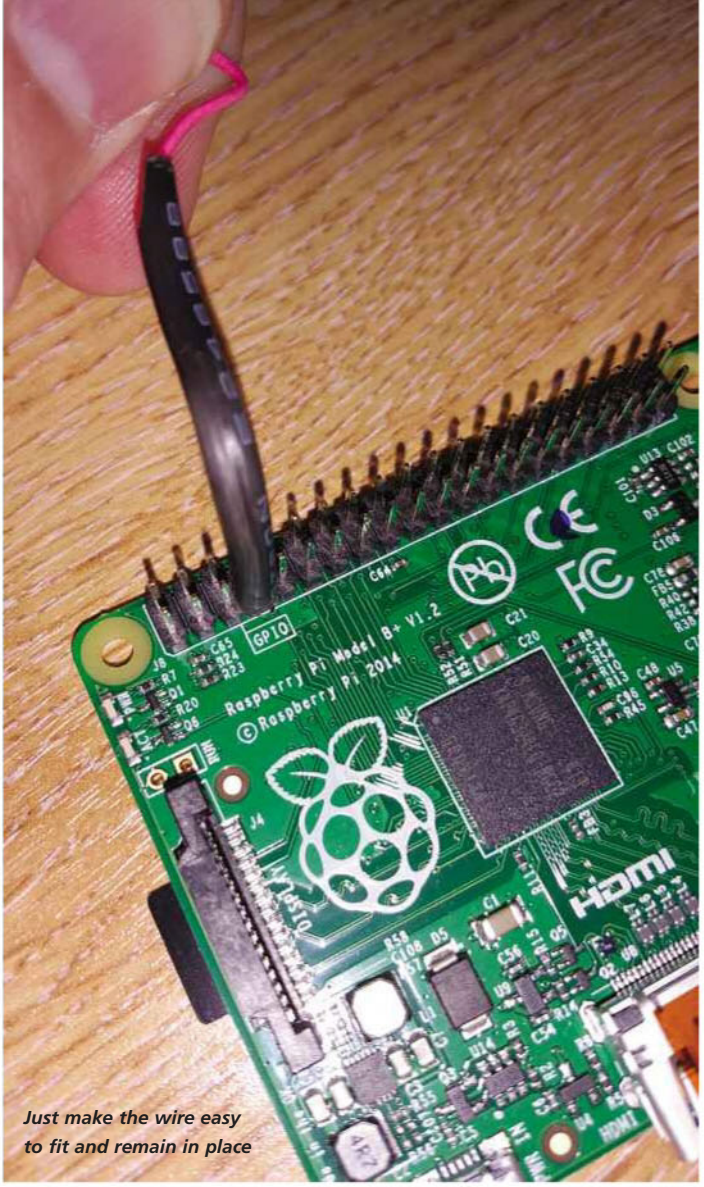
4K Monitors

Philips, LG, Dell, Asus and BenQ all have some spectacular 4K panels in their arsenal, but Samsung is showcasing the first curved 4K monitor and expects it to be available to buy for Christmas.

Mind you, unless you own an oil well or two, then like most consumers, you won't be able to afford the £8,000 it costs.



The aerial needn't be the kind you see strapped to the side of the BT tower, a simple wire will suffice



Just make the wire easy to fit and remain in place

Raspberry Pi-rate Radio

David Hayward takes to airwaves with a hacked Raspberry Pi

There are countless hacks for the Raspberry Pi these days. Such is the legacy of this remarkable little computer that if you can think of it, the chances are someone, somewhere, has modified the Raspberry Pi and bent it to the task. With this in mind, we were searching the other day for a suitable project; one that's quick and easy but can deliver results, and among the many retro arcades, TV streaming appliances and other serving duties, we discovered a tutorial that can turn the Raspberry Pi into a powerful FM transmitter, allowing you to broadcast your own pirate radio station.

Making An Antenna

The first step in the process is to make the antenna. For this you'll need a length of wire of around 50cm – you can go up to 75cm apparently, but any more than that will cause problems in the broadcasting. For our example, we stripped and used an old PC audio cable wire. It worked, but it wasn't the most effective solution, so you'll have to experiment with what you have lying around.

Start by attaching one end of the wire to Pin4 on the GPIO connector (GPIO 4), for our example we wrapped the wire around the pin and protected and held it in place, with a piece of wire tubing.

Software

The PiFM radio transmitter uses the already created PiFM Python script, from Imperial College Robotics Society as created by Oliver Mattos and Oskar Weigl. To install it you'll to enter the following in the terminal first:

```
wget www.icrobotics.co.uk/wiki/images/c/c3/Pifm.tar.gz
```

This will download the compressed files. You'll need to unpack them next, with:

```
tar –xvf Pifm.tar.gz
```

Once everything is unpacked, you can start to play audio files, which will be transmitted on an FM band of your choice.

For the sake of this experiment, we'll start by using the Sound. WAV file that came with the PiFM package. You'll need to use sudo to play it, and you can specify the frequency in Megahertz at the end of the line. For example:

```
sudo ./pifm sound.wav 100.1
```

Will play the sound, broadcasting at 100.1. It'll take a moment or two before you'll hear anything, but you should get something through when you tune in to 100.1 FM – the theme for *Star Wars*!

Expand

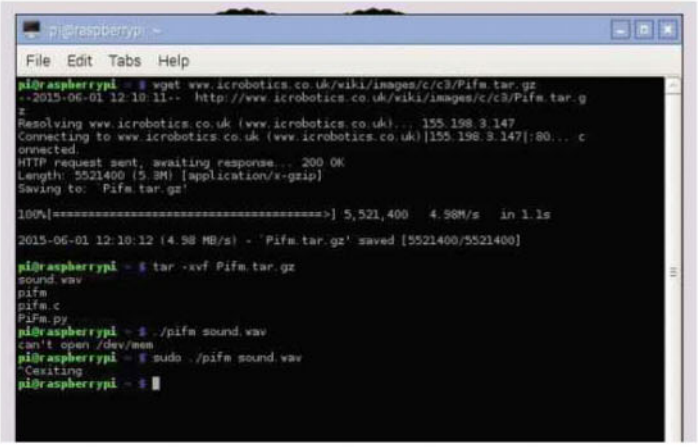
If you have a selection of MP3's to play, instead of WAV files, then you can easily convert the MP3 file on the fly using SoX sound exchange codec. Simply install SoX first, with:

```
sudo apt-get install sox libsox-fmt-all
```

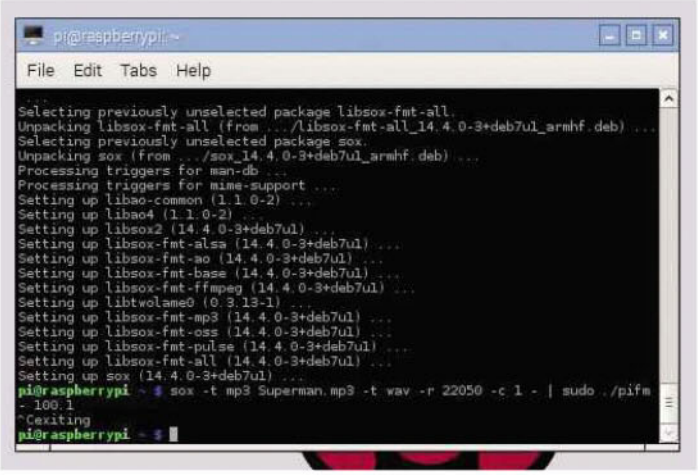
Then once it's installed, use the following command to play the MP3 at the same 100.1 frequency we used earlier:

```
sox –t mp3 NameOfTrack.mp3 –t wav –r 22050 –c 1 - l sudo ./pifm -100.1
```

Download and uncompress the PiFM scripts



Once installed, as such, you can tune in the radio and listen to the test sound



Installing SoX will allow you to convert MP3s on the fly to WAV files

Disclaimer

As you no doubt read in the main body of the article, transmitting on FM frequencies can have a detrimental effect on commercial aircraft and tower transmissions. We're not radio experts, so we can't tell you for sure just how much damage a small strip of wire connected to a Raspberry Pi could do. Suffice to say, if there's even a hint of trouble, you're best off experimenting with caution.

Alternatively, you could always Google away and see if there's a safe frequency to broadcast on. Or you could get in touch with a local radio expert or maybe even Ofcom, to ask for the details on how to do this without causing all sorts of problems with local flights and so on.

Also, on a more lighthearted note, if you do connect a USB microphone, please try to resist the urge to shout "Shabba!" down it every so often.

With luck, the music should be played through an appropriately tuned radio to 100.1 FM. Obviously, you'll change our Superman.mp3 to your own MP3. And to exit playing the content, just press Ctrl+C.

There's More

If you have a podcast running, then you can also use SoX to broadcast the podcast through the PiFM module to your tuned in radio. All you need is the address of the Podcast as an MP3 – which most advertise – and to enter the following:

```
sox –t mp3 http://address.of.the.podcast.mp3 –t wav –r 22050 –c 1 - l sudo ./pifm – 100.1
```

And you also broadcast an online radio station by pointing SoX at its M3U file, with:

```
sox -t mp3 http://address.of.the.online.radio.station.m3u -t wav -r 22050 -c 1 - l sudo ./pifm - 100.1
```

Finally, you don't have to use MP3 with SoX. If the broadcast or file is OGG, for example, just replace the sox –t mp3 part of the command line, with sox –t ogg.

A Big Hello To All You Truckers Out There...

One last element that's worth mentioning. If you have a USB microphone handy, you can broadcast your voice over the radio waves by entering:

```
arecord -fS16_LE -r 22050 -Dplughw:1,0 - l sudo ./pifm - 100.1 22050
```

Unfortunately, we couldn't try this part as we didn't have a USB mic that would work or be recognised with the Raspberry Pi. That and the fact that we'd probably revert to our former 80s mobile DJ mode of speech stopped us this time.

Conclusion

There we have it. A simple, one wire and a bit of software solution to creating your own Raspberry Pi FM transmitter. However, we have to mention that if you're to give this a go, then please take a moment to read through our disclaimer. Airband communications can be severally messed up with a powerful enough antenna and a transmission that uses the wrong frequency. And, as far as we can tell, the police take a very dim view on home users clogging up the airwaves with their own pirate music stations. mm

Microsoft Office Sway

David Briddock investigates Microsoft's intriguing new addition to the Office family

Microsoft's Office portfolio is regularly subjected to product updates and refreshes, but it's rare to see a new addition to the Office family. Yet on 1st October 2014, Microsoft announced Sway, a brand new Microsoft Office app, destined to be a key element in the forthcoming Windows 10 rollout, due some time this summer.

Sway Is Different

Sway, just like Word, Excel, PowerPoint and OneNote, is focused on content creation, but there the similarity ends. Sway offers a brand new approach to authoring content. The core concept is to turn any browser into a story-telling digital canvas. A dynamic, interactive canvas without borders, edges, page breaks or cells, which is easily filled with text, photos and images plus multimedia in the form of audio and video clips.

In a recent blog post Microsoft said, "It's a new way for you to create a beautiful, interactive, web-based expression of your ideas, from your phone or browser. It is easy to share your creation, and it looks great on any screen."

This means Sway opens up new possibilities. For instance, you could publish daily photo diaries, non-linear presentations and other interactive content that would usually require specialist tools and knowledge.

Browser And Cloud

To create or view a Sway, all you need is a browser. Any browser will do, which means you're free to create and view Sways using the full range of computing platforms, including smartphones, tablets, laptops or desktops.

The final product is quite different from a traditional document. At the end of the creative process, you'll have something called a Sway, composed from a blend of ingredients and stored in the cloud.

These cloud-native Sways aren't contained within a single file type or format, which makes them very different from other office apps like Word, Excel or PowerPoint. In addition, a Sway automatically adapts to the host platform's native screen dimensions.

Now, let's take a closer look at how to compose a Sway, how collaboration works, the presentation options and the various ways you can share a Sway.

Sway Composition

With the Sway app it's a straightforward task to combine a rich combination of text and media content. This content may be pulled from a local storage system, from cloud storage sites like OneDrive or from internet services like Twitter, Facebook and YouTube. As the product matures, this import list will be extended.

Sway aids the composition process via a set of semi-automated layouts. What does this mean in practice? Firstly, as you import text, photos, images or multimedia clips into Sway, it uses a built-in algorithm to determine the most appropriate layout for this particular piece of content. This content-driven process uses the same kind of advanced software that filters and organises mixed-media Bing search results.

Secondly, the Sway app assists authors by intelligently arranging content into the assigned layout in a smart, hands-off yet polished-looking manner. These layouts automatically transform each content item into the most appropriate format, depending on the editing/viewing platform, so a smartphone layout looks quite different to a desktop one, for instance.

For the author it boils down to a rapid, hassle-free authoring process. As if by magic, every text element, image, multimedia clip, Tweet and so on is instantly incorporated and arranged in a ready-to-view Sway.

> **"The core concept is to turn any browser into a story-telling digital canvas"**

Sway Design

Of course, once these automatic steps have taken place, you're free to change anything you'd like.

What you'll see is a collection of high-level topics, presented as a selection of titled image cards and navigated in a 2D or 3D style flow. You can change the card order or select a particular card to view the details and begin editing.

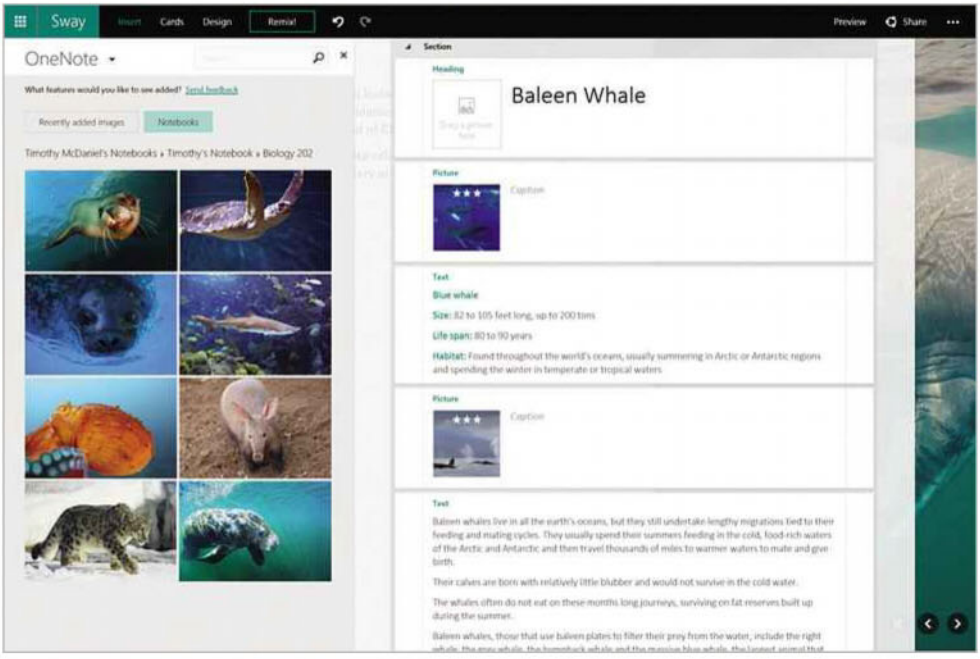
For example, you could change the title, textual content, move elements, add and remove images, embed a video, choose a new colour theme or even select a different layout style.

Sway is full of tools that simplify editing, so if you'd like a particular photo to be more prominent, you don't have to start playing with pixel dimensions. Instead, just tap the image and select the appropriate number of stars from a menu.

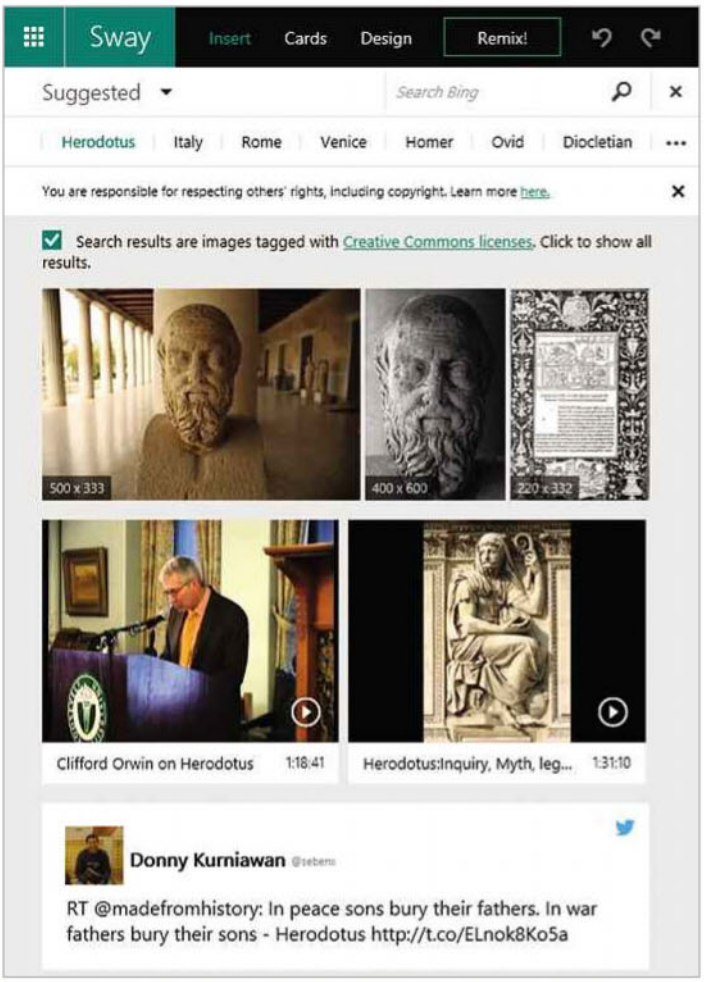
Rearranging elements is just as easy. Simply drag them around, and they snap into the locations defined by the current layout style. Another composition trick involves ranking items in terms of importance. This helps Sway to ascertain the overall flow of content.

And remember, every addition, modification or deletion is instantly saved back to the cloud. This ensures your Sway is

Sway layouts



Import OneNote images into Sway



Sway search questions

always up to date, just as we've come to expect with cloud-stored OneNote documents, for instance.

Sway Collaboration

Until very recently, Sway creation was down to a single author, but this all changed after a 'Share' button appeared in the new Sway preview, so now there's a number of ways to control the visibility of a partly or fully completed Sway.

Selecting 'Public' means the Sway can be found by anyone searching the web, while the 'People with the link' option limits access only to those sent a Sway link, and specifying 'Just me' means it's restricted to people using the creator's login information.

This feature means family members, friends, colleagues and other invitees can co-author a Sway. When they click on the link and log in, the Sway shows up on their personal 'My Sways' page, with an icon to indicate it's a shared Sway, and, because every time the Sway is edited it's saved back to the cloud, everyone sees the 'live' Sway.

If a group of people edit a Sway at the same time, you'll see their account information displayed along with their names. You can also see which parts of a Sway are currently being edited, because their initials are displayed next to the card they're currently working on. If there's an editing clash, then the last one to make an edit wins.

Importantly, overall control is always retained by the original Sway owner, which means it's a straightforward task for this owner to remove other editors or revoke any existing edit and share links.

Sway Scenarios

Sway is an ideal tool for capturing live events in real-time – for example, if you're attending a conference, a sporting event or taking part in a school field trip. Before, you'd probably snap a few photos, then try to organise a future time slot long enough to build a presentation. With Sway, the motto is 'do it now', and Sway's ability to capture and present in a non-linear manner adds to the creative possibilities.

But what if all you have with you is a Windows Phone mobile device? Well, you can still create a Sway quite easily using the Cortana personal assistant.

With Cortana, you just speak to create titles and textual content, then quickly insert a collection of on-the-move photos. A few screen taps later and the whole thing is sent to Sway's intelligent design engine, which automatically builds the Sway and saves it to the cloud.

Sway is also perfect for interactive group-based activities. A typical scenario would be in a classroom where the teacher and students can work together and witness a Sway taking shape right in front of their eyes. Anyone could contribute an idea, a text snippet, a sketch or drawing, a sound clip or video stream.

> **"To create or view a Sway, all you need is a browser. Any browser will do"**

Due to the flexibility of Sway, the class could even be split into groups, each one creating a different Sway. The resulting Sways could then be merged together to form a single collaborative Sway.

And by sharing the Sway link, other teachers, other students and even parents can see view the product of their creative endeavours.

App Previews

The initial, and it has to be said rather limited, Sway preview appeared on 1st October 2014. Unfortunately, this was by invitation only, but by December 2014 Microsoft had the confidence to invite the public to download a new Sway preview.

In case you might be thinking Sway is a premium-level product in the Microsoft Office suite, there's no need to worry. Sway will be available for free, just like Windows 10 itself.

In fact, it gets even better. Sway is destined to become a Windows 10 Universal app, and that means it's not only available on Windows 10, but it's also be free to download for Windows Phone, Apple iOS and Google Android platforms.

In addition, subscribers to the popular cloud-hosted Office 365 app suite can look forward to receiving enhanced inter-app collaboration capabilities around the time of the official launch, and anyone who's paid for the full version of Office can look forward to a Sway update soon, possibly one with enhanced integration features.

Links
Home page: sway.com
Promo video: goo.gl/OaSgQQ
Intro video: goo.gl/t8cbtd

OneDrive
OneDrive is Microsoft's cloud storage facility, which was named SkyDrive when launched way back in 2007. It's where your Office 365 documents, OneNote documents and images are stored, and now it's where you'll find the 'My Sways' repository.

You can access OneDrive from PCs (Windows, Macs and Linux), tablets (Android and iOS) and smartphones. Anyone with a Microsoft account gets 15GB of free OneDrive space, and more space can be added for just a few pounds a month.

OneDrive competes with Google Drive, Apple iCloud and DropBox. This strong competition ensures attractive storage deals are always on offer.

Feedback And Future
What's the thinking behind releasing the Sway app at such an early point in the development cycle? And why is Microsoft releasing Sway previews so frequently?

Well, the answer is Microsoft is intent on making Sway the first publicly collaborative Office product, one in which many of its features and functionality are influenced by an interactive partnership between the Microsoft development team and the Sway user community.

For Microsoft, this is a radically different approach to app development. With classic Office apps like PowerPoint, a very small team made all the design decisions about the sort of features people might want.

With Sway, it's feedback that helps drive many of the team's decisions, and this feedback helps determine the urgency or importance of each feature and helps refine the Sway team's project planning and scheduling.

So whenever you find Sway mentioned on a Microsoft website, you'll also notice messages encouraging everyone to send feedback. Feedback can be sent by the usual communication and social channels, but there's also the Sway-specific UserVoice page (**goo.gl/HhYrDd**) to simplify the feedback process still further.

Of course, involving a large community means there are bound to be many interesting ideas that a small Microsoft team wouldn't have thought of by themselves. It's an approach that's already been used for the public releases of the new Microsoft Edge (previously Project Spartan) browser and Windows 10 itself, via Microsoft's Windows Insiders Program (**insider.windows.com**).

It's still very early days with Sway. There's lots more development to do before the app is finally released, so any feedback you provide today may well make its way into the final product, and then you could say, "That's the feature I suggested."

Even better, all you need to view a Sway is a browser, so anyone can click on a Sway link to discover what others have already achieved with this app, plus the sort of events that have been captured, and in the process expose ideas about how to incorporate Sway into everyday life.

2015 Updates
In early March 2015 Microsoft announced a new Sway preview showcasing the latest feature set. One new feature is the ability to add images saved in the OneNote application to their presentations. Options include selecting from the most recently saved OneNote images or picking images directly from OneNote notebooks.

This is just the first incarnation of OneNote integration, and Microsoft is looking for feedback on importing other types of OneNote media into Sway. As it says, "Before we add more functionality, as part of Sway Preview, we want to make sure we understand which additional capabilities you would like to see from OneNote integration."

Images are an important ingredient for any Sway. Now the team has added two more methods to help make them more interactive and engaging. Firstly there's the image comparison feature, where you use a slider to visually compare two images overlaying each other, rather than having to view them side by side. As the slider moves, it gradually hides one image so you can see more of the other. Simply choose the images to be compared and select the Card Comparison option.

Secondly there's slideshow, which is an ideal way to present all your images in one place. Here you can view multiple images in the form of a carousel, as a thumbnail-centric slideshow or under manual slider control. Once again, slideshow creation is quick and easy; just select a set of images and create a Slideshow card.

> **"Sway is an ideal tool for capturing live events in real-time"**

Following Sway feedback, the team has also ensured it's simple to copy a Sway. This means you can take an existing Sway and use it as a starting point for a new creation. Maybe you'd like to build a Sway collection that captures the progress of a project over time, or maybe a teacher wants to give their students a basic Sway layout example for a specific classroom project.

In addition, there are more multimedia import options, which now include Office Mix, Infogr.am and Mixcloud, as well as from existing Sways. There's a larger range of photo layout options too, and the improved Sway search function offers 'suggestions' related to Tweets and YouTube videos.

More To Come
We'll certainly see more Sway previews over the next few months, with more features to explore like additional styles and layouts, improved editing options and greater language support. And that means more opportunities to provide Microsoft with the sort of feedback that'll influence the future of Sway.

So head on over to **sway.com** and try it out for yourself. mm

Kobo Glo HD

Michael Fereday has been checking out a new Kobo ereader

DETAILS
- **Price: £109.99**
- **Manufacturer: Kobo**
- **Website: www.kobo.com**
- **Required spec: n.a.**

Ebook readers have been with us for many years, but it wasn't until the Kindle came along that E-Ink products really took off. To this day, Amazon's device has a huge share of the ereader market in the UK, but in recent years, Canadian company Kobo has managed to find itself a decent foothold, by offering high-quality alternatives at a reasonable price.

Now it's adding to its range of ereaders, with the Glo HD. This particular model comes with a standard-to-micro USB lead for charging the device or connecting it to a computer, but there's no three-pin adapter plug for mains charging, which means you'll have to provide one yourself or stick with using a computer for charging.

With a weight of 180g and a 6" Carta E Ink HD touchscreen, the Glo HD is an obvious challenger to the Amazon Kindle Voyage for those looking for a new ereader. The Glo HD's screen has a resolution of 1448 x 1072 pixels, which works out at 300dpi.

The Glo HD is powered by a 1GHz processor. As there's no memory card option, you're limited to 4GB of storage space with just over 3GB being available for your personal use. This amount should be enough for building up a library of around 3,000 titles from the 4.5 million available from the Kobo online store or from other sources. Unlike the Kindle's walled garden approach, you can source your Kobo reading material from various places such as W H Smith's stores with an appropriate franchise or your local library as long, as the titles are in one of the supported formats of ebooks: EPUB, EPUB3 and PDF. That makes it a far more open device than the Kindle, which is definitely a point in its favour over Amazon's dominant ereader.

When reading content, you can switch between pages either with a tap on the edge of the screen or a sideways swipe. A tap in the screen centre will open up options to change the font from the 11 supplied with the product. You can also adjust the size and weight of the font characters plus select from alignment settings.

When firing up the Glo HD from Sleep mode, which uses the book cover of your current title as its screen display, you arrive at the screen within a speedy four seconds. This will feature your current title, new books, recommended items, top 50 books and recent selections. There are also options to call up features categorised as Library, Bookstore and Extras.

The Library feature includes a list of your books and any collections you have created. Particularly handy is the Pocket feature, which allows you to capture online articles for later reading. This can be done on any computer or device running pocket, and then synced to the cloud, you could, for instance, save a news story on your PC and then pick it up later on the Kobo.

Selecting Bookstore allows you to connect to the Kobo online store and purchase titles using your account, plus check out recommendations based not just on your previous books but on the reading habits of those who have read the same titles. In the Extras section, you can see stats on your reading habits, awards you've received from Kobo, and you can access a dictionary too.

The Kobo Glo HD provides an enjoyable reading experience in various lighting conditions with smooth page turning and a refresh every six pages. Based on 30 minutes reading a day with the ComfortLight and wi-fi features turned off, Kobo claims you should get two months of use out of a single battery charge.

All in all, it's a worthy competitor to any ereader on the market, including those from Amazon.

mm Michael Fereday

EDITOR'S CHOICE micro mart

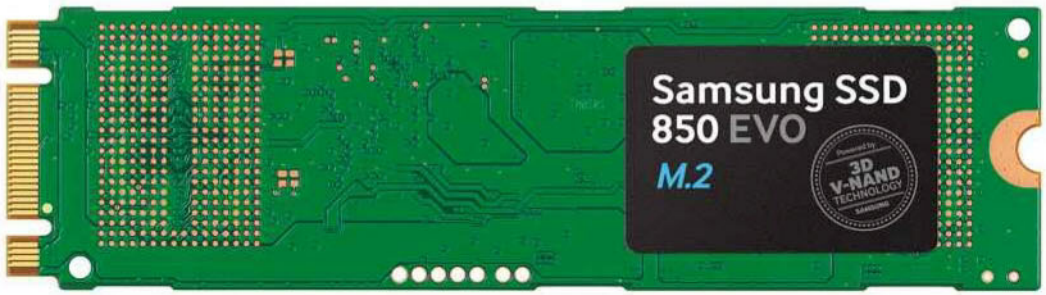
A well-designed HD ereader, attractively priced

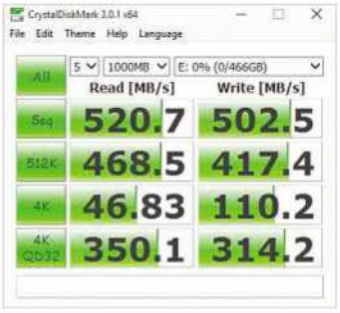
micro mart
9 Quality
10 Value
9 Overall

Samsung 850 EVO M.2 500GB

Samsung turns its attentions to laptop SSD upgrades

DETAILS
- **Price: £160.98 (Ebuyer)**
- **Manufacturer: Samsung**
- **Website: www.samsung.com/uk**
- **Required spec: System with M.2 SATA interface**





Regular reader of the magazine may well have caught my previous reviews of the new Samsung 850 EVO line of SSD drives. They're generally great performers and competitively priced, for those who can use the 2.5" drive formats.

M.2, on the other hand, is a new standard that is appearing in many laptops and also on the odd high-end motherboard. It pares the module down to the very physical limits, and now Samsung has pushed its 3D V-NAND stacks onto this form factor.

The module is a 2280 specification device, meaning it's 22mm wide and 80mm long. It comes with a B & M edge connector, and it's made for a M.2 SATA connection.

That last point is critical, because M.2 supports two standards that are entirely incompatible: SATA and PCIe. Samsung has promised me that later in the year it will deliver the PCIe products, but at this point the 850 EVO is only available in SATA mode.

That essentially limits the performance of this product to the same ball park as other SATA-connected SSD drives, because it's SATA-3's available bandwidth that is usually the limiting factor.

If I compare the M.2 version or the 850 EVO with the 2.5" version, there are very few differences indeed. However, one critical point is that this 500GB model is the largest M.2 drive on offer, as I presume Samsung has not worked out yet how to stuff 1TB into this space.

In terms of performance, the M.2 has marginally slower sequential write speed, at about 500MB/s versus 520MB/s on its bigger brother. However, it's sequential read speed is identical, and its IOPS also track closely.

What this product is offering is a decent capacity and good performance for any laptop/Ultrabook owner that needs a boost. Having tested a few of the SSDs that laptop builders include and found some to be most wanting (Dell, that would be you!), the Samsung 850 EVO M.2 seems like a good option.

Surprisingly, considering this item is still something of a speciality item, it's only about £7 more than the 2.5" product.

If there is a caveat to the M.2 line in general it's that most systems that use it only come with one M.2 port, making a system transfer extra challenging. And it won't fit in the space allocated for a 2260 module, should you only have one of those.

As a product, the M.2 version of the 850 EVO is desirable and comes with a five-year warranty, but it's somewhat unexciting in the face of the coming PCIe version. That should smash the 500MB/s barrier to bits, though it won't fit any of the systems that this version does and vice versa.

Those looking to enhance their existing systems need to make sure this will work and fit before investing. Those criteria met, this is a worthwhile enhancement that could markedly improve system performance for those who need it.

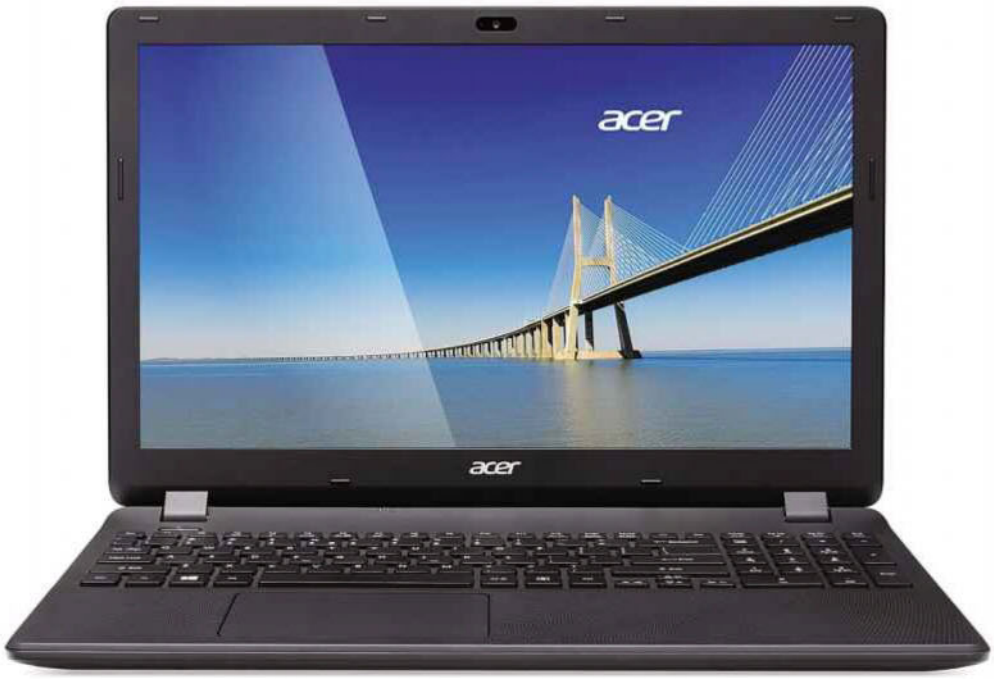
mm Mark Pickavance

Much like the other 850 EVO drives, but now in M.2

Acer Extensa EX2508-C3QZ Notebook

Sometimes inexpensive hardware comes with excessive drawbacks

DETAILS
- **Price: £279.99**
- **Manufacturer: Acer**
- **Website: www.acer.co.uk**



Buying a notebook for a person who isn't good at looking after their hardware is problematic, and as a father I've made those choices. You can either spend an outrageous amount on something designed to withstand cluster-bomb attack or go with something cheap, cheerful and ultimately disposable.

The Extensa EX2508 is certainly in the latter category, being less than £280 for the C3QZ variant Acer provided.

The positioning is decidedly entry level, but I still can't help but be slightly amazed by what you can get for that money in terms of features and functionality.

The computing focal point here is the Celeron N2840, a dual-core Bay Trail-M processor that runs at 2.16GHz (2.58GHz Turbo) and has a modest TDP of just 7.5 watts.

On this rig it's connected to a healthy 8GB of DDR3L and a 1TB hard drive, so it's given a modest chance to impress from the outset.

Visuals come courtesy of a 15.6" LED backlit display with a natural resolution of 1366 x 768. This is the part that probably shows the tight fiscal constraint under which the Extensa has been made, because the viewing angles aren't good, and flat colours appear to have a curious screen grain visible on them. The screen isn't the worst I've seen by a long way, but it's nothing worth writing home about – or on, for that matter.

> **"A serviceable machine that can handle general light office duties"**

In terms of other features, it's an odd combination of the good, bad and decidedly ugly. At the positive end of the spectrum I'd put the inclusion of a SuperMulti DVD drive, Bluetooth, a single USB 3.0 port along with two USB 3.0 ones, a full-size keyboard with numeric pad and an SD card reader.

Less wonderful is a LAN port that doesn't support gigabit speeds, only 'n' class wi-fi, and a VGA resolution webcam.

But probably my biggest complaint here is where Acer chose to place almost all the ports, along the hinged edge – a location where port damage is almost inevitable.

I also explored the upgrade possibilities and effectively concluded there are none, because the machine doesn't have an access panel, and getting inside involves a major dismantling exercise that even this writer passed on attempting.

Where cheap notebooks usually take a real kicking, though, is in terms of the battery life, but the Extensa is actually quite respectable there. Acer claims six to seven hours with some battery management (turning down the screen brightness, etc.), and my tests suggested that these weren't too optimistic. Even with moderately heavy use, you should be able to get five hours or longer if you're just watching videos or listening to music.

The software side of this equation is also something of a mixed bag. As a promotion, Acer

is currently providing a year-long subscription to McAfee LiveSafe supposedly worth £59.99. Frankly, I would have easily paid an extra fiver not to have anything from that software vender pre-installed on my PC.

Undoubtedly a better deal is the pre-installation of Windows 8.1 with Bing that should be upgradable to Windows 10 for free soon.

Regrettably, Acer decided that beyond the OS it would unleash the demonic hounds of crapware on the poor Extensa, so I'd allocate at least two or three hours to removing the 30 or more items of dubious value it's recklessly pre-installed. Then you'll need another five hours to install the hundreds of updates that Windows 8.1 needs to become current. The halcyon days where you could just buy something and start using it immediately are a thing of the past, apparently.

Looking past the crapware, chiclet keyboard and badly placed external ports, this is a serviceable machine that can handle general light office duties, surfing and YouTube playback. At least it can be, once you've uninstalled anything that sucks overall performance through numerous uncontrolled background tasks.

That's the critical factor on this machine, because it's living on the cusp of usability, and without some constraint being exercised by its owner, the chasm of progressive sluggishness beckons.

It managed a score of just 1211 in the PCMark 8 Home 3.0 Accelerated test, about a half of what you'd expect from a low-end office PC. Therefore, there isn't much, if any, gaming potential beyond *Angry Birds* level graphics, even if the GPU seems workmanlike. There just isn't enough CPU power to render 3D titles at playable frame-rates using the natural screen resolution. For that, you really need to spend a little more and have at minimum a Core i3 under the hood.

And that's the rub here, because while it might offer great value for money initially, it also likely that for many users will discover its limitations all too quickly.

Therefore, it's probably only ideal for a very occasional user.

mm Mark Pickavance

An underpowered notebook that's strongest feature is the price

SB-2501

Michael checks out a soundbar that comes with its own headphones

DETAILS
- Price: £199.99
- Manufacture: Evolve
- Website: www.evolveaudio.co.uk
- Required spec: n.a.

The Evolve SB-2501 is a soundbar with a wireless subwoofer and comes with bonus wireless headphones for private listening sessions. Included in the package with these elements are leads for mains power, USB charging facilities and the link connectivity between the soundbar and a television. You also get a remote control unit with a button battery.

A touch-sensitive control panel takes up a central position on the front of the soundbar. There are options for power, effect, source, volume, 3D sound, Bluetooth and wireless audio, but you have to look closely to identify which is which. Fortunately, though, the remote control can be used to implement these features.

The rear of the soundbar contains an on/off switch, connections for the 12V power lead, optical connection to a television plus RCA and 3.5mm jack sockets. Built into the soundbar are six 40mm 4ohm acoustic drivers that can deliver up to 60 watts of output helped by 24-bit audio DSP and 24-bit audio codec plus a 2.4GHz digital wireless audio transceiver.

This last item provides the means of linking the soundbar to the wireless subwoofer. As the two units come pre-paired, the linking process should be automatic. The subwoofer holds a 6" drive unit delivering 60 watts of output. On the rear of the unit are connections for a DC 15V mains power, a USB port for charging an external device such as a smartphone, power switch and a pairing button, if you need to re-establish a connection with the soundbar. Re-establishing a connection requires the pressing of two pairing buttons, and you can also use this procedure when linking the supplied wireless headphones. These headphones are of the on-the-ear style featuring a rigid unpadded headband and leather strap for resting on the head. I found that the earpieces, when fully extended, only just reached my ears. As a result, these headphones were uncomfortable to wear for even short periods. Unfortunately, while you can pair other devices that stream audio, these are the only headphones to work with this soundbar.

Using the remote, you can activate and control the soundbar's features. You can adjust volume and bass levels, plus cycle through audio sources such as Bluetooth, television or aux. There are pre-defined effect settings designated as Music, Movie, News and Sport for different types of output, plus the ability to turn on/off Definitive Surround Sound features referred to as 3D. While I was unable to detect any noticeable difference between the various sound effects, I did notice an occasional slight dropping off in sound quality from my Sony Bravia television but not when using Bluetooth devices.

mm **Michael Fereday**

Reasonable without being outstanding

Western Digital My Passport Ultra 1TB

WD revamps a classic with some innovative new features

DETAILS
- **Price: £59.99**
- **Manufacturer: Western Digital**
- **Website: www.wdc.com**
- **Required spec: PC or Mac with USB port (USB 3.0 recommended)**

Opening this package from Western Digital, I was wearing my typically weary face of cyclic experience. Surely I've seen enough external drives to last a Time Lord's lifetime? But – and a rare occurrence this is – the changes Western Digital has to this product are more than cosmetic and, in the end, rather compelling.

However, starting from the outside, the new Passport design uses a combination of surface finishes and angles that make it both elegant and pleasing to hold. The 1TB review model is the same thickness as the one it replaces at about 15mm, and the overall scale seems almost identical.

But where previously the sides were square, they're now slightly bevelled, probably to help with the 'Grip Pack' accessories WD has also released.

The drives come in three sizes ranging from 1TB to 3TB, and in four colours. These are described as Classic Black, Brilliant White, Wild Berry and Noble Blue, and to these you can add further variation using the £9.99 Grip Packs that offer a protective band and matching cable in five shades (smoke, slate, grape, sky and fuchsia).

Factor in use of the original coloured USB cable, and that's 40 variations for those with plenty of drives to uniquely identify. That personalisation and an extra degree of protection can be yours for £9.99.

However, the true value of this new version isn't in the colourful accessories. It's in both software tools that Western Digital bundled with it and the hardware encryption it's baked in.

Pre-installed on the drive are WD Backup, WD Security, WD Drive Utilities and WD Quickview for the PC. Using these, you can secure your files to the drive or cloud, activate the built-in 256-bit AES encryption and manage the external storage.

Comparable tools are also provided for the Mac, although Apple's own Time Machine does the backup job, and you'll need to reformat the drive to an OS X compatible file structure.

There still isn't a bare-metal backup solution provided, and the only cloud option is DropBox, but in terms of bundled apps they're not half bad and generally useful.

The encryption is an especially powerful option, because once you've activated the password control option, getting to the contents will be very problematic without it.

It's a generally accepted view that the security services know how to crack AES through either guile or brute force, but without those resources, what's on there is probably safe from even an experienced hacker.

Performance is about what I was expecting from a Western Digital 2.5" drive connected by USB 3.0, at around 115MB/s in both directions. You can get faster drives, but given that this is quicker than a 1Gbit network source, it's probably more than fast enough for most office users.

In the end my only real disappointment was that the makers didn't grasp the nettle of USB-C connectors on this new generation, but I'm sure those will come along at some point.

In the meantime, if you want a compact external drive to secure some sensitive data, then the My Passport Ultra is still one of the best options.

mm Mark Pickavance

Features
- Secure portable storage with up to 2TB capacity.
- Optional 256-bit AES hardware encryption.
- Automatic local and cloud backup.
- Stylish design with a range of exciting colours.
- USB 3.0 connectivity.
- Formatted for Windows, reformatting required for Mac.
- Three-year limited warranty

The perfect external drive for those in business

micro mart
8 Quality
8 Value
8 Overall

Subnautica

Dive many leagues into an alien world and try to survive as long as possible

DETAILS
- **Price: £14.99**
- **Manufacturer: Unknown Worlds Entertainment**
- **Website: goo.gl/W57WC6**
- **Required spec: Windows Vista or later, 2.5GHz dual-core CPU, 4GB RAM, Intel HD4600 GPU or better**

Open world survival games have fast become the norm on the PC. We've been tasked with trying to outlast a zombie apocalypse, survive being stranded on a deserted island and found ourselves washed ashore on some unknown land. Either way, the basic mechanics of the games are very much the same: eat, drink, heal, craft and survive.

Subnautica, developed by Unknown Worlds Entertainment, puts a slightly different angle on the survival genre, in that you can explore the three-dimensional world of an alien ocean. But the premise is very much the same.

The game has you as the lone survivor of a crashed colony spaceship, set many years in the future. A strange energy blast forced the ship down on to an oceanic alien world, and you managed to make good your escape in a handy lifepod.

This is where the game starts. A first-person look at the confined space of the lifepod reveals very little, but if you climb the ladder to the outside, you'll see the expanse of water you're currently floating on, complete with the burning wreckage of the ship in the distance.

Moving back into the lifepod, you can explore the interior more, which offers a Fabricator, a kind of Star Trek Replicator that can create all manner of objects from various elements, and a Fragment Analyser, which will break up component parts and provide blueprints for devices and upgrades.

The many rows of teeth give the intentions of this fishy fiend away

Gliding through the depths of the alien world is an amazing experience

Every so often, you'll catch a glimpse of a mighty leviathan

However, it's when you leave through the bottom airlock of the lifepod that you come to appreciate the work that has gone into making *Subnautica*. Once you plunge into the briny abyss, the game becomes far more than just your basic survival affair. Food is abundant, but you'll need to catch the fish and have them analysed for suitability before you can fill your belly. Other resources are within easy reach of the lifepod too, such as materials, scrap metal from the crash, crystallised elements and an assortment of flora and fauna that can be used.

There are three difficulty levels available to begin with: Freedom, Survival and Hardcore. The Freedom level will allow you to explore more without having to manage your hunger; all you'll need to do is keep a check on your health and oxygen levels. Survival forces you to live as close to reality as possible, managing everything, and should you perish, then you'll respawn and lose some of your loot. Hardcore, of course, is a one-off game where once you die, that's it.

The game itself looks amazing. The graphics are sharp, and the movement of the water and the creatures within are a joy to behold, and when you begin to come across some of the bigger creatures, you're in for a graphical treat indeed.

Unfortunately, the game suffers from a distinct sameness and an unbalanced survival system. Your oxygen doesn't last long, you get too hungry and thirsty too quickly, and death is never far away. It may be realistic, to some degree, but it's a bit too harsh to begin with.

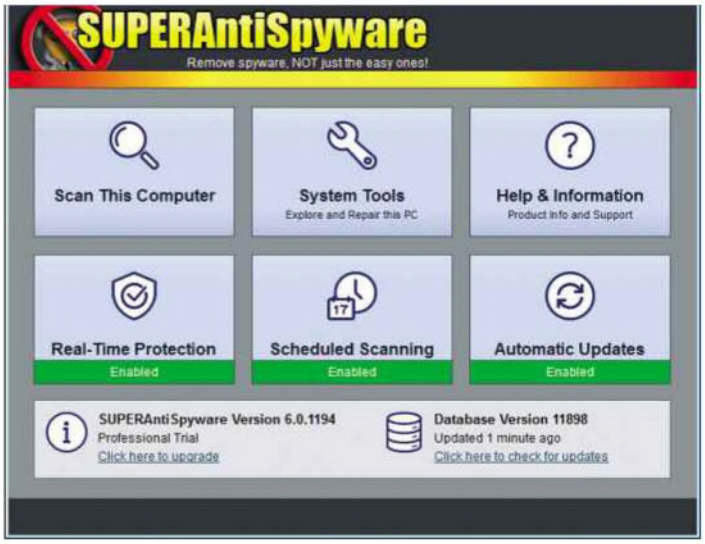
For an Early Access game, *Subnautica* is very interesting, but further content will greatly enhance it and offer a little more than simply swimming around and collecting fish while trying to build an underwater base. If scuba diving is an interest and you own an Oculus Rift, then this may be a worthwhile game, otherwise it might be worth waiting for the completed version. **mm David Hayward**

A tad too expensive for an early access game

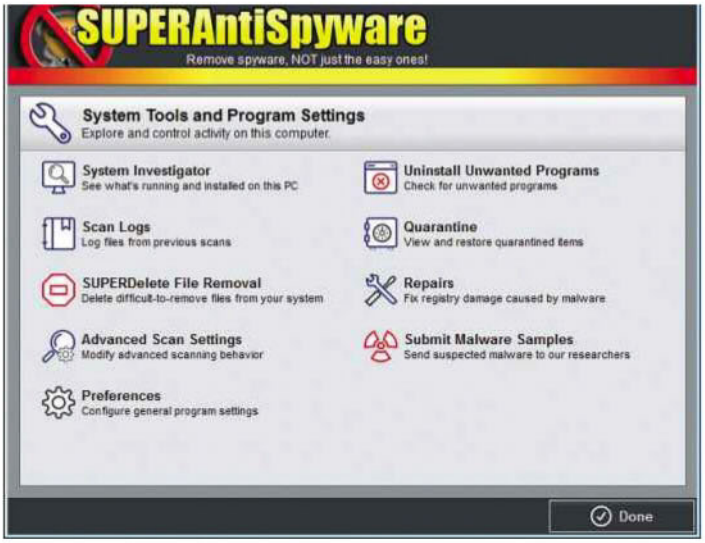
SUPERAntiSpyware 6

Boost your security with a tool to provide a second line of defence

DETAILS
- **Price: £19.75**
- **Manufacturer: Support.com**
- **Website: superantispyware.com**
- **Required spec: Windows XP or later, 1GB RAM, 1GHz CPU, 15MB disk space**



A plain and simple interface ensures that SUPERAntiSpyware is easy to use



There are tools to help you investigate possible infections and repair damage

Malware like spyware, viruses, Trojans and other threats is showing no signs of diminishing, so security software is still essential on Windows PCs, despite attempts by Microsoft to make the operating system more secure. SUPERAntiSpyware has just been updated to version 6, and it aims to protect your PC from spyware.

All security programs detect spyware as well as viruses these days, so you may question whether an extra spyware tool is necessary or wonder whether it's good enough to be used on its own. The answer is Yes and No. This is not intended to be your only defence against all types of malware, but rather a second line of defence. It is designed to work alongside your regular software and provide extra protection.

The free version provides manual scanning of the disk drive, whereas the Pro version includes real-time protection, automatic updates and scheduled system scans.

The interface, which has been redesigned in this latest version, is easy to use. The home screen has tiles for scanning, tools, setting up schedules, updates and configuring real-time protection. The scan options include the usual complete, quick and custom scans. You can also right-click files in Explorer and launch a scan. Version 6 has faster scanning, and there's an option in the settings to activate Scan Boost. It can be low or high, and it basically uses multi-threading to speed up scanning. The scanning options are very similar to anti-virus software, so you can ignore non-executable programs, ignore or scan zips and so on. Files can be set as trusted, folders can be excluded and so on.

The new System Investigator tool in SUPERAntiSpyware 6 is useful for analysing what's running with Windows and determining whether items are safe or unsafe. You can choose which areas to analyse, such as start-up items and browser plug-ins, or analyse everything. A report is shown after each category has been analysed, and it categorises items into safe, unsafe and unknown lists. There are useful options, such as ignoring items scanned previously and just listing changed ones.

When unknown items are found there are thumbs up and down buttons, and you can click them yourself to indicate safe or unsafe files. You can also see how other people have rated it. It's basically crowd-sourced security advice. This is a useful tool for monitoring changes to the system and getting opinions on strange files that appear on your PC.

Additional tools enable you to fix registry damage caused by malware. It resets a whole range of items like Task Manager, the Run box, IE home page, the system tray, certain faults with the internet and network connection, and more. Files that can't be deleted can be forcibly removed too.

The free version of SUPERAntiSpyware 6 is definitely worth having as a manual scanner and second opinion. There are some useful extra facilities in the Pro version, and while on the website I was offered a big discount on the price: £13.16. For that price, it's hard to ignore.

mm Roland Waddilove

Anything that's cheap and increases security can't be bad

GROUP TEST

Computer Controlled & Digital Microscopes

Computer Controlled & Digital Microscopes

Celestron Cosmos LCD Digital Microscope

DETAILS
- **Price: £275**
- **Manufacturer: Celestron**
- **Website: goo.gl/rXSvmG**
- **Required spec: Windows XP or later, Mac OS X 10.6 or later, spare USB port**

▲ *Hooking it up your PC is easy and allows you to control the images taken*

A few weeks ago, we covered a selection of computerised telescopes, to look far into the depths of the inky abyss. This time around, we thought we'd look in the other direction, into the microscopic world around us.

David Hayward has been taking six digital and computer controlled microscopes out for a test drive and is brave enough to look at the anatomy of a wasp up close.

Celestron's star gazing products are probably some of the best around. As a company that excels in producing high-quality optics and finished solutions, Celestron has its fair share of products to choose from. However, in this instance we're not looking up. So how does the company's range of microscopes fare?

The Celestron Cosmos 5MP LCD Desktop Digital Microscope is quite an advanced looking piece of kit, with a list of equally impressive specifications to match. There's a five megapixel CMOS imaging sensor that provides a clear 10x magnification in lieu of the traditional eyepiece. This projects the image to a clear, full colour 320 x 240, 3.5" LCD screen mounted and suitably angled for easy reading, at the top of the microscope.

The LCD features six buttons along the bottom, under the screen, for power, settings, confirm, mode, down and play. To the left-hand side you'll find a slot for a micro-SD card, where images can be stored, and on the right-hand side there's a zoom wheel and LCD brightness wheel.

Magnification ranges from 4x through to 160x using the LCD screen. However, if you connect the microscope to a PC via the USB connector and you install the Celestron InfiniView software, then you can increase the overall magnification of an object to an impressive 800x, although 200x seems to be the most focused magnification on the screen. The software also allows you to control every aspect of the microscope, and instead of saving recorded content to the SD card, you can opt to save it to the computer or any number of locally connected or remote drives.

The pedestal (or stage) is naturally height adjustable and has a couple of metal clips to hold the object or slide you're looking at in place. It's perfectly functional, although we did think it felt a little flimsy when we were placing items on it.

The ability to take images and even record video of what you're looking at is a nice touch and one that will certainly appeal to a younger audience. It's an ideal discovery tool for the 'young scientist' or just those who have an interest in the microscopic world around us. Furthermore, you can take advantage of the rechargeable lithium-ion battery and use the microscope in the field, as it were. The battery life is okay, lasting a couple of hours of continual use when simply viewing. Once you start taking images and recording, then you'll find it drains pretty quickly.

The build quality is great, aside from the rather flimsy feeling stage. The controls, dials and quality of the screen are superb. It weighs roughly 1.6kg, which makes it quite a sturdy microscope but not too unwieldy if you were to take it out into your garden.

Overall, we were suitably impressed with the Celestron Cosmos 5MP LCD Desktop Digital Microscope. There are plenty of handy features, it's a high-quality product, and there's a lot of fun and discovery to be had from it. All in all, we think it's well worth its price.

Wishtrac Easi-Scope

DETAILS
- Price: £45.59
- Manufacturer: Wishtrac
- Website: goo.gl/cyD4uK
- Required spec: Windows XP or later, Mac OS X 10.4 or later, 512MB RAM, spare USB port

The Easi-Scope is an idea handheld discovery device for children

It's easy to use and will open up a new world for eager minds

A traditional microscope can be a daunting object for a younger person to use. The fear of breaking it or the uncomfortable position you end up in when using one in a classroom can put a child off. As a result, they'll lose out on taking part.

The Wishtrac Easi-Scope could be solution. It's a handheld microscope that can fit into a child's hand and connects to a PC via a USB port. The image sensor is a 350K pixel VGA CMOS that captures at a resolution of up to 640 x 480, with a maximum magnification of 43x.

As with the Celestron Cosmos, the Easi-Scope is capable of capturing still images and video and exporting them via the Digital Viewer software. All you need to do is press the button on the top of the device, and it'll start recording as per the specification you selected.

It's a neat little device that measures just 50 x 50 x 74mm and weighs just 104g. The single USB cable is around a metre and a half in length but can be extended by using a USB male-to-female extension cable without any noticeable loss in quality.

As a first time discovery tool for children, the Easi-Scope is ideal. But if you're working with older kids or as a home project, then you may need something a little more powerful. The included software is functional enough, but it seems a little dated in its operation. And although the quality of the lens and the magnification are generally good, you'll soon find yourself wanting a little more once you expand your knowledge.

> **"The Wishtrac Easi-Scope is a great little handheld microscope"**

However, for a primary classroom environment, the Easi-Scope is great. You can hook it up to a whiteboard and display the images, and it's tough enough to withstand the usual knocks, drops and bumps this kind of device will get from small hands. What's more, the Easi-Scope only costs £45.59, which makes it excellent value for money for a child with an interest in the microscopic world.

As the focus of the Easi-Scope is on young people with their parents or teachers, the operation of it is extremely easy. Once it's all hooked up and installed, you only really need to press the button and away you go. Each component is screwed into place, with a selection of adaptors for easy viewing of different objects, including the subject's face, nose, ears and so on to less personal objects, like dead spiders, plants etc.

On the whole, the Wishtrac Easi-Scope is a great little handheld microscope. We can see the potential for youngsters to use it to get a start at looking at a magnified world, and there's plenty of magnification to keep them entertained for some time. As we said, though, if you're thinking of using it with older kids or you require something with a little more power and future usefulness, then you'll want to look elsewhere.

VT-300 LCD Microscope

DETAILS
- Price: £234
- Manufacturer: ViTiny
- Website: goo.gl/Lloifz
- Required spec: Windows XP or later, spare USB port

A digital portable microscope is a pretty handy tool to have if you're into looking at the microscopic world. The Easi-Scope required a connection to a PC, so it's clearly not ideal for fieldwork. And the first item on test, the Celestron Cosmos, although portable thanks to the rechargeable battery, is a little bulky to carry around over yonder hill and dale.

The ViTiny VT-300 LCD Microscope therefore lies somewhere in the middle of the two. Think of it as a kind of microscope digital camera – one that's small enough to slip into a pocket but still capable of displaying a lot of microscopic detail.

The dominant feature is the 2.8" TFT LCD screen which, like a traditional digital camera, has numerous controls to the side for magnification, taking a still image, recording a video and as an added feature, the ability to measure the length, circumference and area of a subject.

The two megapixel CMOS sensor offers a decent enough magnification between 10x to 40x and can take still images up to a resolution of 1600 x 1200 and video to a resolution of 640 x 480, either saved as AVI or MP4, to the built-in 2GB flash memory.

It's an extremely easy device to get to grips with.

The VT-300 looks more like a digital camera than a microscope

The design works well, and the included cradle helps with static objects

We've already said this, but it operates in pretty much the same way as a digital camera, so most users will take to it without having to read up too much. The only difference,s of course, are the magnification dials above the lens (next to the LCD) and the zoom/snapshot button at the top of the unit. Getting the best optical magnification together with the digital zoom can be a little tricky, especially if you're hovering over an object and looking at the screen, and the fact that digital zoom function can hit a reasonably good x200. But with a little practise, you'll easily have the right combination soon enough.

The software is a little basic: just a simple image extraction and editing tool. To be honest, you're better off with the default picture editing suite you have installed. Without the software, the VT-300 acts as an ordinary USB drive, so you can copy and paste images from it to your PC. An added bonus of the VT-300 is that it can support Skype, MSN and other webcam imaging and recording programs.

To help with the microscopic feature, you get a cradle, which the VT-300 slots into. The cradle has a basic stage with plastic clips to steady the subject and a dial to raise or lower the lens to the required height. Although it's handy, it does feel quite poor quality when compared to the good all round quality of the VT-300.

On the whole, the ViTiny VT-300 is a good portable microscope. It's not the most powerful product available, but it'll suffice for field trips. There are a couple of problems, though. The lack of an SD card slot is a bit annoying, and the price is a little too high for what the device is capable of, but if you shop around, you could probably find one for less than the standard £234 price.

XinRay Handheld Digital Microscope

DETAILS
- **Price: £140**
- **Manufacturer: XinRay (various other unbranded versions)**
- **Website: goo.gl/ykjUV5**
- **Required spec: Windows XP or later, spare USB port**

XinRay Opto-Electronic Technology Ltd isn't likely a company you've heard of before. However, if you own a generic webcam or security camera equipment, then the chances are its from XinRay.

The company's product list is long and would probably only appeal to those who like looking at images of cables, but among them is the Handheld Digital Microscope. This is an interesting product, one that will most likely appeal to someone who spends a lot of time outdoors, who requires a quick and easy solution for instant magnification of an object.

The 3" TFT screen folds out and swivels around much like a camcorder, revealing an array of buttons that control power, options, up/down, okay and play. Along the top you'll find a digital zoom wheel, with the optical zoom being placed on the protruding lens section.

The optical magnification is rated at an impressive 250x, with a further 4x digital zoom, thanks to the 5MP image sensor. It takes still images up to a resolution of 1600 x 1200 and video to 720p.

Connectivity is good: there's the standard micro-USB port to hook up to a PC, plus you'll find an AV-out for connection to a projector or TV and a micro-SD slot to store content on. Without using the software, the XinRay hooks up to a PC and is recognised as an external drive, so any content can be easily transferred across.

The XinRay Digital Microscope is reasonably good

There are a couple of quality issues, but it'll do the job

We'd love to comment on the software that comes with the microscope, but for some reason it failed to install correctly no matter how many times we tried it on both our Windows 7 and Windows 8 systems. Whether this was an issue with our setup or just dodgy software, we're not sure, but as we said, the microscope connects to a PC regardless of the software, and you could transfer via the micro-SD card if you have a card reader.

Sadly, without the software, we couldn't control the microscope via a PC which, according to the instruction, you should be able to do. But it's not too much of a problem, because the 3" screen is pretty good and displays a clear image.

In addition to the microscope, you also get a small metal stand, with an adjustable arm, which fits into place where a standard tripod would normally go. Setting everything up including the stand is quick and easy, and the battery lasts a good few hours before you'll need to recharge it.

The build quality, however, isn't all that good. It feels quite cheap, and we'd be concerned about how long the screen hinge will last with frequent use.

For £140, the XinRay Handheld Digital Microsope is a reasonable enough buy, but there's good chance it may not last all that long.

micro mart
6 Quality
7 Value
6 Overall

Celestron Mini Handheld Digital Microscope

DETAILS
- Price: £38
- Manufacturer: Celestron
- Website: goo.gl/VPQVQb
- Required spec: Windows XP or later, Mac OS X 10.4 or later, spare USB port

Although you'll soon reach its limits

Now for the second Celestron product in this group test. The Mini Handheld Digital Microscope is a more compact product, which is available online or from the likes of Maplin for a mere £38.

The Celestron Mini is small enough to fit into the hand and can be held like a pen, although it's considerably thicker, with a 32mm diameter. Its diminutive body houses a 1.3 megapixel CMOS sensor capable of a maximum resolution of 1280 x 1024 and a maximum magnification of 30x.

The Celeston Mini Handheld Microscope is pretty good

It's USB 2.0 powered and connects to a PC via a two-metre cable. Once connected, the microscope can be controlled using the accompanying Digital Microscope Suite software that allows you to capture still images and videos.

Operation of the Celestron Mini is easy enough, much like the Easi-Scope. All you need to do is place the microscope over the object and move the focus ring at the bottom of the device to get the image as sharp as possible. You can then press the single snapshot button at the top of the microscope to take an image or start recording a video.

In addition to the above, the microscope can also be used with other image capturing software, just like a scanner, so you can pull images from it to nearly any imaging software for saving or manipulation.

The Celestron Mini is really designed for the hobbyist or young person, for some lightweight magnification duties. Getting the focus right is a tricky business to begin with, and if you're using this with a very young child, then the chances are they'll find it a little frustrating.

The magnification isn't the best we've seen so far. It's okay and the magnified image is certainly clear enough, thanks to the good-quality lenses Celestron generally uses throughout its microscope and telescope ranges, but you'll no doubt end up in much the same boat as with the Easi-Scope, in that you'll very quickly outgrow the product.

On the other hand, we found it useful for reading those near unreadable prints you find on motherboards and other electronics and PCBs. And the Celestron Mini is light enough (weighing just 82g) to manhandle around the workbench.

In terms of build quality, it's very good – certainly up to Celestron's usual high standards. It'll take a drop from your hand to a desk without causing any damage to the lens, so you don't have to treat it with kid gloves.

It's a limited microscope, though, with it being permanently attached to a USB port and PC. We can see some use from it, if you have something specific in mind, but as we said, it'll lose its appeal very quickly otherwise.

dnt DigiMicro Lab 5.0

DETAILS
- **Price: £115**
- **Manufacturer: dnt**
- **Website: goo.gl/Ota1ah**
- **Required spec: Windows XP or later, Mac OS X 10.5 or later, spare USB port**

The dnt DigiMicro Lab 5.0 is very similar to the first product in the group, the Celestron Cosmos. It's a more traditional looking microscope, but with a large 3.5" TFT colour screen built-in to the top.

The five-megapixel CMOS sensor can output an image resolution of up 2592 x 1944, with a video resolution of 640 x 480 and an optical magnification of up to 250x with 4x digital magnification.

The DigiMicro Lab 5.0 can be connected to a PC, via a USB port on one side, but there's also a micro-SD card slot for saving images and video to. With it connected to a PC, the included software allows you to control the imaging side of the microscope, while you'll still need to set the focus and move the wheel for the optical zoom and positioning of the table.

Although the Lab 5.0 looks and behaves in very much the same way as the Celestron Cosmos, there's a huge difference in quality. The Cosmos is of a very high standard, but the DigiMicro Lab 5.0 isn't. In fact, it's pretty shocking just how bad this microscope is.

The movement of the stage is terrible, as it stutters up through its height, the optical zoom is very difficult to get right most of the time, it seems to ages to get up and running, and the lens seemed to be permanently out of focus. To add to that, the entire manual is in German, as is the on-screen display, and we never did manage to find out how to change it to English.

It may look okay on the surface, but its build quality is poor

> **"The only redeeming feature is the good battery life"**

Moreover, the supplied software failed to install several times, and when it finally did work, it failed to connect to the microscope. There's also the option to use the DigiMicro Lab 5.0 outside and, as with the Cosmos, there's a rechargeable battery in the base. The battery has a two-hour use rating, but we found it lasted a little longer, at about two and half hours of continuous use – obviously stand-alone and not hooked up to a PC. Even when we took several images and videos, the battery didn't seem to take much of an impact.

We didn't have much luck with the dnt DigiMicro Lab 5.0, which is a shame, as it looked like it might have been a cheaper match to the Celestron Cosmos. Even though the DigiMicro Lab 50 costs just £115, we can't recommend it. Even if the connection problems and the on-screen language setting could be solved, the build quality is well below par. The only redeeming feature is the good battery life.

In short, if you're looking to buy a more longer lasting computer controlled microscope, then you're better off spending a little more and opting for the Celestron Cosmos instead of the dnt DigiMicro Lab 5.0. It'll last you longer and you'll get more from it.

micro mart
3 Quality
3 Value
3 Overall

Celestron Cosmos LCD Digital Microscope

It may well be the most expensive item in the group, but if you're after a high-quality digital and computer controlled microscope, then the Celestron Cosmos LCD will be the one to get.

Wishtrac Easi-Scope

Although it has its limitations, the Wishtrac Easi-Scope is a great little handheld microscope. We love that it's designed to fit in a child's hand and that it's designed for the classroom too.

How We Tested

Each microscope was connected to either a Windows 7 or Windows 8 PC, with the relevant software installed as necessary. For testing the microscopes we used a collection of bug specimens as supplied by Celestron – various ants, spiders, wasps, beetles and so on. It was quite horrible – especially the wasp.

	Celestron Cosmos LCD Digital Microscope	Wishtrac Easi-Scope	ViTiny VT-300 LCD Microscope	XinRay Handheld Digital Microscope	Celestron Mini Handheld Digital Microscope	dnt DigiMicro Lab 5.0
Price	£275	£45.59	£234	£140	£38	£115
Dimensions	149 x 104 x 227mm	50 x 50 x 74mm	121 x 56 x 26mm	130 x 130 x 29mm	89 x 32 mm diameter	197 x 144 x 150mm
Weight	1.6kg	104g	130g	145g	82g	1.3kg
Portability?	Yes, rechargeable battery	1.5 metre USB cable	Yes, rechargeable battery	Yes, rechargeable battery	2 metre USB cable	Yes, rechargeable battery
Max Magnification	160x	43x	40x	250x	30x	250x
SD Card?	Yes	No	No	Yes	No	Yes
Mega Pixels	5.0MP	350k	2MP	5MP	1.3MP	5.0MP
Max Image resolution	1600 x 1200	640 x 480	1600 x 1200	1600 x 1200	1280 x 1024	2592 x 1944

Your Letters

Remembering The Spectrum

Your recent journey into nostalgia for the Sinclair Spectrum brought a smile to my face. I was involved in the home computer retail business during the 'golden era' of the home computer, the early eighties.

Here in Dublin, among the trade, the Spectrum was seen as the Austin Allegro of home computers, however.

Atari were considerably better represented than in the UK, though, because of the Coin Op division over here.

There were also 2600 VCS machines produced in a factory in Limerick.

So here's a non-scientific experiment to try – go online and try to buy a T-shirt with the logo of your preferred 8-bit machine. Then show the T-shirt to a tech savvy teenager and see which brand is most familiar, and ask what they know about the history of the company...

John Cully, Dublin

Windows 10 Tab

A Windows 10 tab has appeared on my PC and laptop, and I can't help wondering if it is a trap. When I was forced to upgrade from XP to Windows 7 I was left with a scanner and a film scanner, and some other bits and pieces, that no longer had drivers.

I tried very hard, but the manufacturers just wanted to sell new kit rather than support the old. In one case the manufacturer is out of business, so they at least have an excuse. Fortunately I was able to dual boot, so I can still use my scanners, etc., when I need to – but in terms of operating system upgrades, it really may be a case of 'bitten once, twice shy'. Except, of course, I had exactly the same with previous upgrades.

Windows 10's advertising feature tells me that all is well and that everything will work fine with Windows 10 when I upgrade. But, it passed the scanners which can't work with Windows 7 as perfectly fine and will work with Windows 10. Which leaves me somewhat cynical about the accuracy of the 'Windows 10' 'check your machine' feature. So, I can't help wondering if I will just be left with another load of perfectly good equipment, which has been prematurely scrapped. Can we dual boot Windows 10?

The fact that Microsoft is so desperate that they are giving their operating system away, doesn't do anything to reassure me. I suspect that most sensible people will wait, until lots of magazines and websites have tried the new operating system, before upgrading.

Although my sons, who are stuck with the irritations of Windows 8.1 on their laptops (which seems to me to be an operating system that really doesn't like people who use keyboards and mice), probably have no reason not to upgrade. After all, Windows 10 surely can't be any worse than Windows 8.1, or can it?

David Price

Work Of Scart

In response to Hugh Sheer, Issue 1364, struggling to connect a Freeview SCART output to a VGA input, I will say that converting these through a passive cable was always a hit-and-miss task at the best.

But I can't help thinking that perhaps his cable is not a SCART to VGA, but that he has got a VGA to SCART cable instead.

Morten Kristoffersen

GET IN TOUCH...

By email
letters@micromart.co.uk

By post
Micro Mart
30 Cleveland Street
London
W1T 4JD

Online
forum.micromart.co.uk

The Download Directory

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

It's time for another selection of downloadable delights, and this month's applications include Glasswire, an internet-monitoring tool that allows you to analyse your internet connection; Rufus, a program that lets you turn .iso files into bootable USB sticks; Icaros, a thumbnail generator that extends Windows' filetype support; and ExeWatch, a monitoring tool that prevents .exe files from appearing on your system without permission.

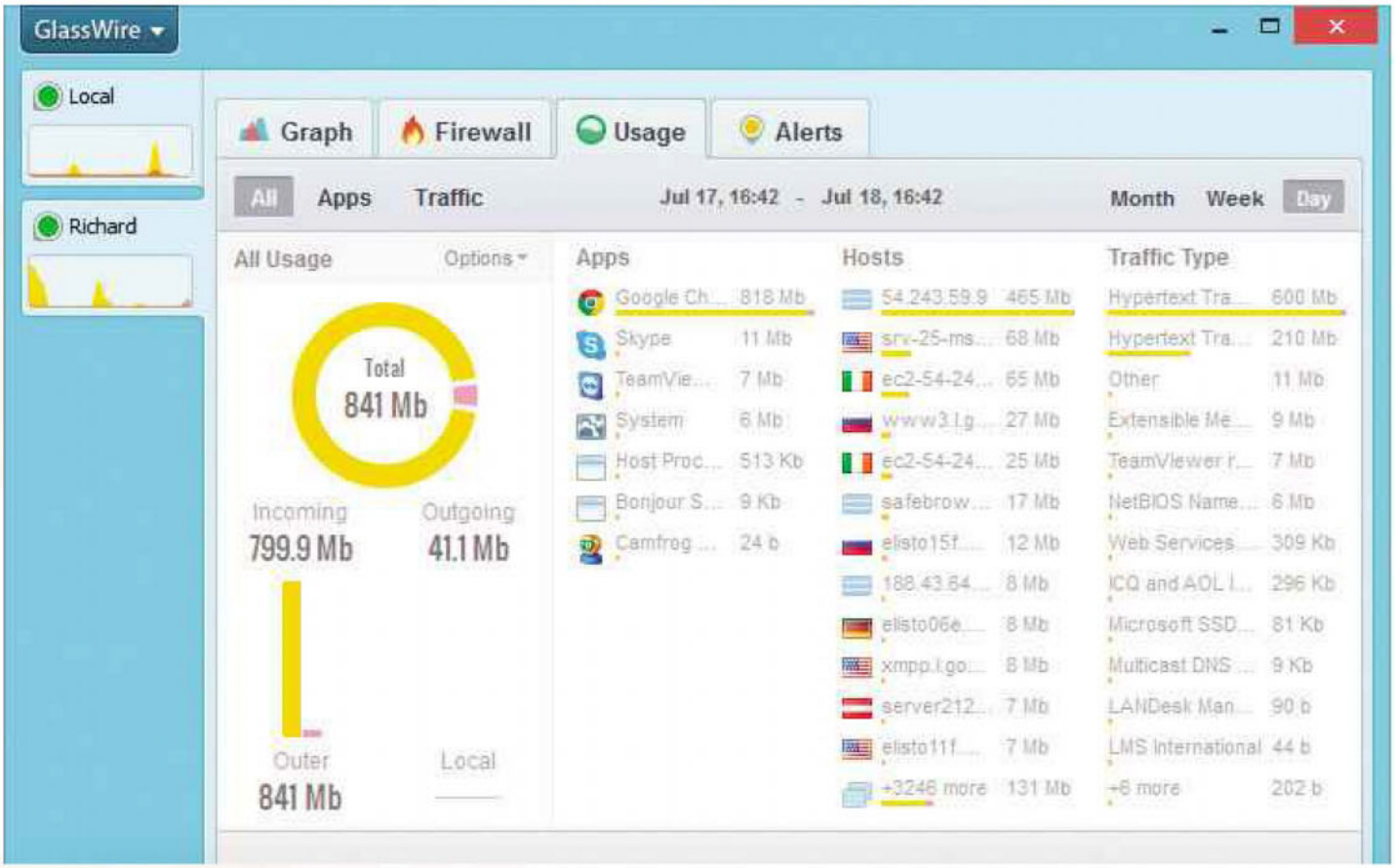
GlassWire 1.1.15

Release Type: Freeware
Official Site: www.glasswire.com

Figuring out what's using your internet connection can be surprisingly difficult for the average internet user. Either your network monitor is too superficial, telling you how much traffic you're sending and receiving but not what's doing it, or the monitoring tool breaks things down with such granularity and technical acumen that you can't really tell what you're looking at without a networking degree.

GlassWire occupies the oft-ignored middle ground in this situation. It's a lightweight, good-looking and simple to use network monitor, which can be understood by virtually anyone at a glance. No degree required.

In its most simple mode, the program presents you with a graph that automatically chugs along, detailing the highs and lows of your online traffic in visual form. There's no heavy technical data, no split between TCP and UDP traffic, and no confusing tables of stats. Just an easy way to see what's



using your traffic and, more crucially, where that traffic is coming from.

It's the little touches that make the program great. When a new piece of software starts using your connection, the graph creates an icon to show you. This means you can associate new

"GlassWire occupies the oft-ignored middle ground in this situation. It's lightweight, good-looking and simple to use"

bandwidth use with individual programs launching, which is especially useful if you don't think you've launched one. Click on the icon, and it'll also show you what program made the request and where the program was aiming for. Essential for troubleshooting and diagnosing malicious requests!

If you want, you can break down the information further for details like bandwidth used per app, activity by traffic type and cumulative usage. By default, it monitors the last five minutes (which you can scroll back through if you want to see earlier), but the graph itself can be reconfigured to display as much as a week's activity. If you want, you swap the trend-centric graphic graph view for some hard statistics on the usage tab, while the alerts tab notifies you of any major changes in your connection behaviour.

Whether you're worried about your internet connection or just interested in what's going on, it's safe to say that GlassWire is the program you need. There's very little bad about it and, more importantly, when compared to the alternatives, it's practically untouchable.

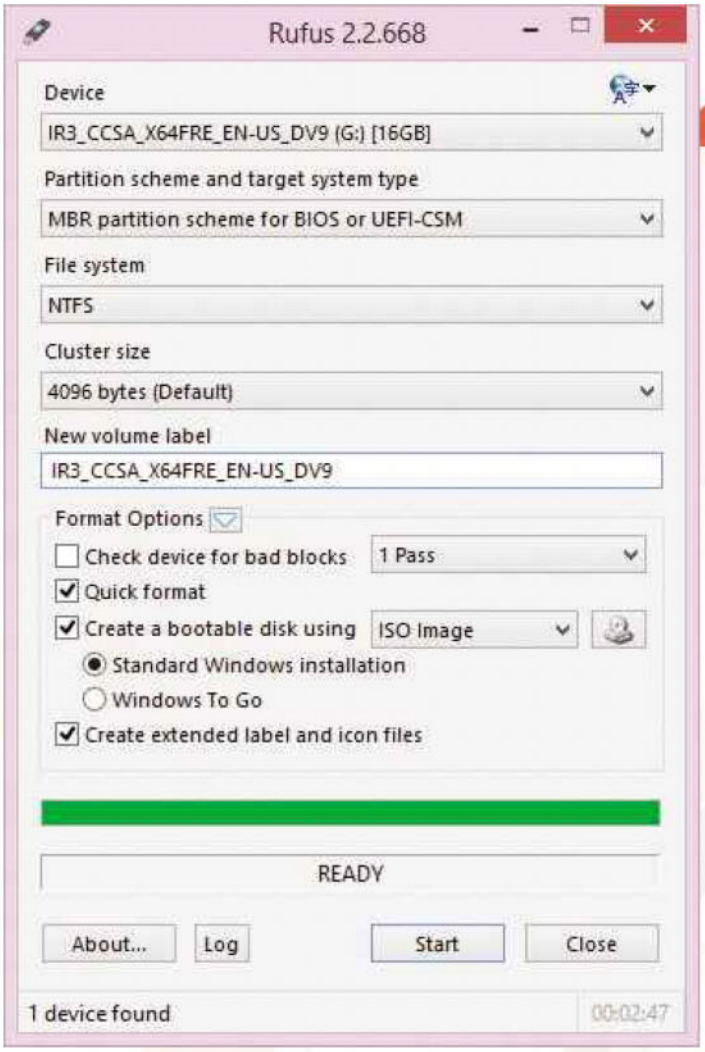
Pros: Simple but powerful.
Cons: None worth mentioning.
Rating: 5/5

Rufus 2.2

Release Type: Freeware
Official Site: rufus.akeo.ie

In the past, creating a boot disk was simple: you only had to format the floppy and leave it in while you booted the PC. Things got more complicated when you had to make boot CDs and DVDs, and these days even they've been replaced by the bootable USB drive. But what if you have a drive image you want to boot from? Not every PC even has an optical drive anymore, so what else can you do?

Assuming you don't want to buy a separate optical drive so you can burn the .iso to a CD or DVD, you could use Rufus to turn it into a bootable USB stick. USB keys have plenty of advantages over optical discs. They're harder to damage, smaller and more portable, can potentially store much more information, and they're considerably faster when it comes to transferring data.



Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

AMD Catalyst 15.5 Beta Drivers

support.amd.com/en-us/kb-articles/Pages/latest-catalyst-windows-beta.aspx

Beta graphics drives are a great way to get an instant performance hike on the latest games, and AMD's latest Catalyst release is no exception. The latest version adds improvements for two games that are hot off the presses: *The Witcher 3: Wild Hunt* and *Project Cars*, offering performance hikes of up to 10% on single GPU Radeon R9 and Radeon R7 cards for the former and a massive 17% for the same cards on the latter.

Since these are beta drivers there are still some issues with them, however, and multi-card systems might want to wait, because even though the download includes an updated CrossFire profile for the *Witcher 3*, anti-aliasing needs to be disabled to avoid micro-stutters. There's also a problem where the game can randomly crash on Radeon R9 285 cards, so if you have one of those, you'll definitely want to give it a miss. Similarly, *Project Cars* players should not use DS2M anti-aliasing. We expect these issues to be fixed in the full release, but if you want a performance hike sooner rather than later, you just have to work around these ongoing issues!

The drivers should be compatible with all existing AMD Radeon-based cards including APUs and mobile GPUs, and are available for Windows 7 and 8 in both 32-bit and 64-bit versions where appropriate.

"In the past, creating a boot disk was simple: you only had to format the floppy and leave it in while you booted the PC"

As an application, Rufus is very simple to use. It's fully portable, so you don't even have to install it, and it automatically detects your USB drive when it's plugged in. All you need to do is point it in the direction of the .iso you want to use and click 'start'. From that point on, it's all done wizard-style. Poorly trained chimps should be able to manage it.

Those who want greater control over the formatting and creation can get it by altering the specifics of how the USB drive file system is configured and how big the disk cluster sizes are, which is important for ensuring compatibility with a wide range of operating systems and software. There's even support for less used technology, like non-standard UEFI and GPT boot disks that are compatible with Unix and Linux-based systems.

Version 2.0 was a major update to the software, which adds support for lots of extra operating systems and improves the UI no end, as well as fixing bugs and adding even more new options.

Of course, one might wonder whether Rufus is going to be much use except on very rare occasions, and in that sense, it's true. This is a program more suited to network administrators and system-builders than home users. But it's good at what it does, it's faster and easier to use than the competition, and there are no major flaws that might put you off it. That, at least, should suffice in making it worth remembering.

Pros: Incredibly easy to use, very effective.
Cons: Only useful in a very narrow set of circumstances.
Rating: 4/5

Icaros 2.3.0

Release Type: Freeware
Official Site: shark007.net/tools.html

Windows' ability to display thumbnails in Explorer is incredibly useful, but that makes it all the more frustrating when, for whatever reason, it completely fails to do so. Usually, it's because the file type just isn't supported by Windows, but that explanation isn't much comfort if you can see the content of files that you know are just a click away.

Icaros is a tool that bridges that gap, allowing Windows Explorer to display thumbnails for video formats that otherwise wouldn't be supported, such as MKV, OGM, FLV and more, and even for audio files with built-in cover art, such as FLAC.

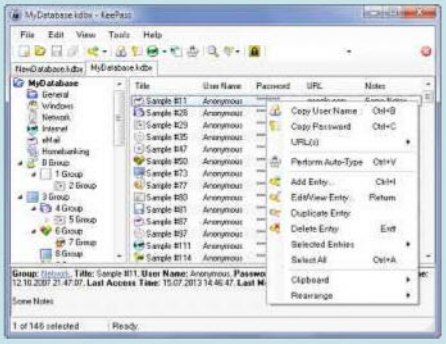
The program works by using the popular and well-supported FFmpeg filter to extract the thumbnail, so if your file type works with FFmpeg, it's a safe bet that Icaros can turn it into a thumbnail. When you launch the software, you'll be presented with a list of filetypes that are currently registered, so it's easy enough to add new ones even if you have only a basic understanding of how different filetypes work. If you can open it in a media player and know the extension, Icaros will try to generate a thumbnail for you.

That's really the extent of the changes you have to make to the software, but it's possible to tweak it further if you like. You can set the thumbnail to generate itself from the middle of videos rather than the first frame, which helps avoid any fade-ins giving you useless intro-logo images, and indeed there's an automatic image detector, which does its best to avoid blank frames entirely.

Again, the program is in active development, and features are being added with remarkable consistency. The only thing that could kill a program this good would be Windows

ReDownloaded

This month, in our regular retrospective section, we're looking back at the June 2013 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.



KeePass Password Safe

keepass.info

Reviewed Version: 2.23, Current Version: 2.29

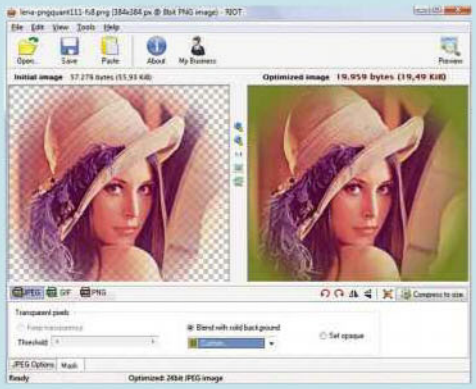
KeePass is a free and open source password manager that also happens to be excellent. Although it hasn't been updated much, it's as simple and portable as it ever was. The only problem is that in the intervening years rivals have integrated features like cross-device support, which make KeePass look like it's lagging. It's still getting regular fixes, but it's going to take a lot more than that to make new versions compete in a fast-changing market.

RIOT

luci.criosweb.ro/riot

Reviewed Version: 0.5.0, Current Version: 0.5.2

A great automated batch-editor for optimising images for the web, it had been going since 2008 when we reviewed it. Unfortunately, it hasn't been updated since October 2013 and is almost certainly dead. Understandable, given that it was an idea whose need seems to have been comprehensively surpassed by the sheer pace of internet connection speeds.

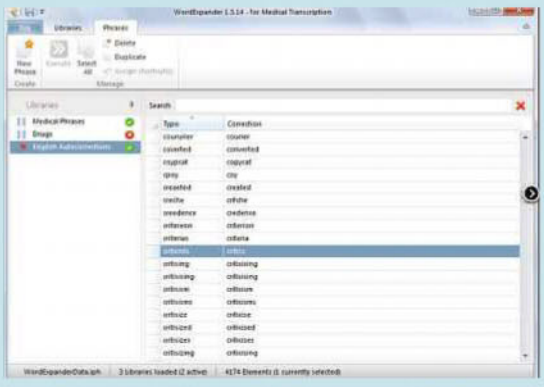


Data Crow

www.datacrow.net

Reviewed Version: 3.11.0, Current Version: 4.0.16

A feature-rich though initially hard to decipher media cataloguing tool, Data Crow has been updated a lot over the years and retains a dedicated user base and a developer who seems genuinely invested in the tool. Whether or not it's for you (it's still feature-rich and hard to decipher), you can't fault that level of continued support.

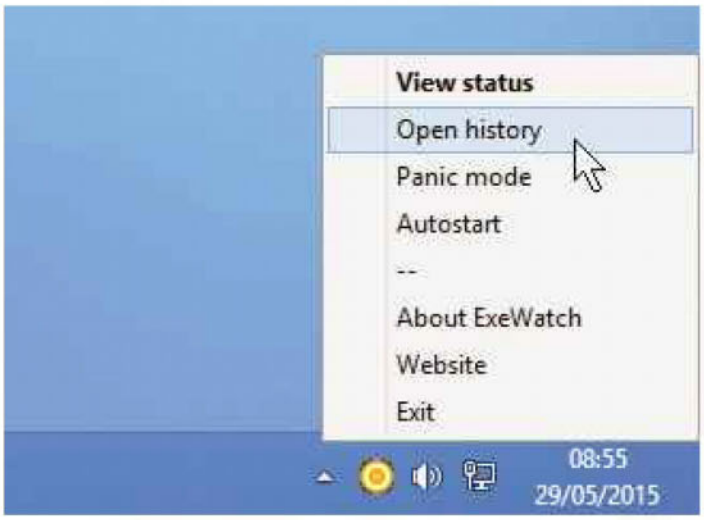


WordExpander

www.wordexpander.net

Reviewed Version: 1.5.14, Current Version: 1.5.15

Oh dear. This application offered OS-level autocomplete and phrase expansion for Windows and, in 2013, was promising a big update to version 2.0 coming soon. Well, it's now 2015, and that update has not yet materialised, with only one minor update in the years since. It's probably safe to say that at this point, it's just not coming.



including default support for its features and filetypes – and frankly, that seems a way off. Definitely worth a look.
Pros: Huge file support but not difficult to set up.
Cons: Extra thumbnails can slow explorer down.
Rating: 5/5

ExeWatch 1.33

Release Type: Freeware
Official Site: trax.x10.mx

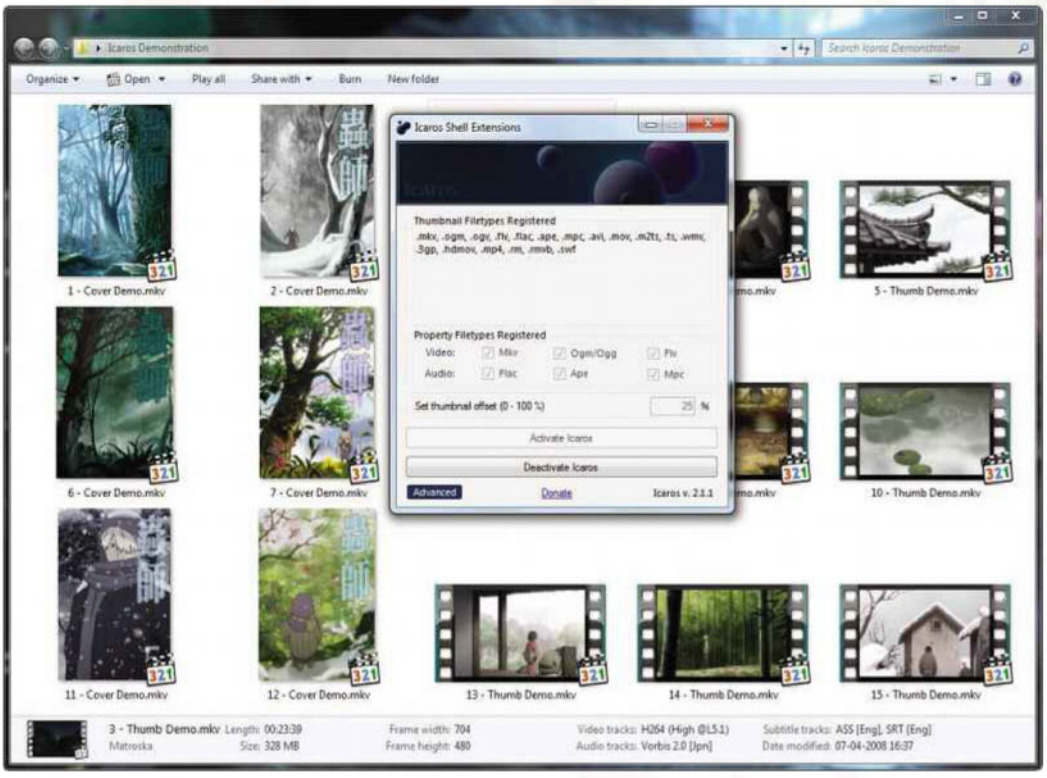
If you worry about where malware comes from and want to make sure you know as soon as any program is installed on your system, ExeWatch might be the tool for you. It's a small applet that sits in your system tray, then notifies you whenever a new executable file appears on your PC, whether on a local or a removable drive.

> **Figuring out what's using your internet connection can be surprisingly difficult for the average internet user**

The idea is that you're able to notice if an executable has been installed or downloaded without your knowledge, and in practice it does do that. But the reality is that 99 times out of a hundred, the new executable is either one you want to install or want to allow anyway. From system updates to legitimate installations, you'll see a lot more .exe files than you expect.

Still, the software itself is tiny and there's no denying its simplicity. You don't even have to install it: just run the software and leave it. Set it to launch on start-up, and you might never notice it getting in the way – at least until an executable file is created on your system, at which point you get visual and audio alerts, together with a log of behaviour that you can check over in the future.

For the most paranoid among you, there's even a 'panic mode', which automatically renames any unwanted executables so the parent process can't find them until you've had a look yourself. Luckily it's possible to exclude certain folders, otherwise this could do serious damage to Windows and other application suites. It's a little fiddly to do this: you have to create exceptions and place them in a text file, but at least you don't have to manually click on every directory you want to exclude.



Ultimately, it's good at what it does, and there's no denying it's a program that would definitely help people who are trying to learn where malware comes from and stop it. But it's not an anti-malware solution that you should use to the exclusion of any others, so in that sense it's a bit of a halfway house, very aggressive but not very protective.
Pros: Simple and lightweight.
Cons: Possibly a bit fiddly and overzealous.
Rating: 3/5
mm

Remembering... Atari ST

This week, we celebrate the birthday of a 16-bit favourite

The arguments in the school yard between the Spectrum owners and the C64 owners didn't stop at the end of the 8-bit era. By the time everyone had ditched their childhood 8-bit computer, the talk of the school was which 16-bit home computer you had: Atari ST or Amiga?

The Amiga was the better machine, technically years ahead of its time and with a far better operating system. I was an ST owner, and I'll concede that fact to the Amiga owners – sad but true.

The ST, though, wasn't without its highlights. It had better audio capabilities than the Amiga, and the CPU was clocked a little faster too. You could hook up a Roland keyboard and have all sorts of electronic musical masterpieces sound off thanks to some clever software. My cousin was something of a wannabe synth expert, who'd clearly been watching *Top of the Pops* too much, but even his limited skills managed to deliver when he connected his synth to the ST.

The ST may not have been the all-powerful games machine that the Amiga was, and it's largely known as the 'failed' one of the two 16-bit giants that went toe to toe, but it was loved by its users and it brought them their first proper GUI mouse operated system after the Spectrum. And since it's now 30 years old, we thought it deserved a bit of a celebratory thanks.

Its History

Apparently, according to Landon Dyer, an on-the-ground engineer at Atari, it was on a Friday afternoon in July 1984 that a rumour spread stating Jack Tramiel had bought up Atari.

Atari at the time was losing money to the tune of around a million dollars a day, a sizeable amount by anyone's standards. Warner Communications, which then owned Atari, eventually sold the Consumer Division to Tramiel and his legion of suits, which in turn became Atari Inc.

The success Atari had previously had with its older, cartridge-based consoles was hoped to continue long into the 80s, but the recession in 1983 put a stop to that. There was also the fact that home computing was born, thanks to the C64 and Spectrum, so the big names at that time had to come up with the next generation of hardware and software.

The Motorola68000 CPU was the heart of the ST project, a processor that was faster and more powerful than the then-current crop. Add half a megabyte of memory to the equation, a vast selection of ports, fast access storage (in the form of the floppy disc) and some custom hardware such as ST Shifter, ST Generalised Logic Unit, ST Memory Management Unit and ST Direct Memory Access and the 520ST was born.

Added to that, of course, was the operating system. TOS was hard coded to a ROM chip, and together with the impressive GEM windowed desktop, the Atari ST was the home computer on everyone's lips. However, 18 months later, the Amiga 500 was launched and the poor ST lost out to the gamers who demanded a more arcade-like experience.

The Good

Amazing connectivity, the MIDI support, *Dungeon Master* and Jeff Minter's contributions.

The Bad

ST BASIC was broken, and it took a few OS versions later to fix it. A faulty floppy drive was a regular occurrence.

Conclusion

The Atari ST was my first 16-bit computer and I loved it. The games were an amazing leap from the Speccy, and it kept me happy for many years until I upgraded to a PC.

Landon Dyer's blog is an immensely amusing and informative read. Check it out at **goo.gl/1tKPK4**.

Did You Know?

- The ST evolved to the STF, STFM, Mega ST, STE, Mega STE, TT030 and Falcon 30.
- The lack of built-in hardware for moving the screen was a nightmare for coders.
- Amazingly, there was a CD-ROM drive planned for the ST, the Atari CDAR-504.
- Atarimusic.net has some amazing chiptunes available, all done on an ST.
- Jean Michel Jarre, Eurythmics, Fatboy Slim and even Madonna used an ST.

The Atari 520ST: a wonderful 16-bit computer

It had some impressive connectivity

RETRO ROUND-UP

Zombies everywhere! Those damned computers from the past! They just won't die! This month's Retro Round-up goes creepy!

In last month's column, I raised a glass to celebrate archive sites. A few days after I finished that article I also had cause to celebrate again when I managed to bag an eBay auction for a collection of Dragon 32 discs (on the original 5.25" format) for £200. This might seem a rather extravagant amount to have paid for 'some old discs', but it represented the best archive find for the Dragon machines in decades. There were, in fact, over 100 discs, all perfectly preserved, all embossed with different stickers and all complete with their original manuals and cases.

The seller explained to me how he had acquired them:

"I bought a Dragon in the early eighties, paid a lot for it too. Looking back, though, going for the Dragon was a bad decision. The machine wasn't really all that popular. DragonData had made a disc drive for it but I never saw a single disc for sale in the shops. Without any software, it seemed like a big waste of money.

"However, away from the high street, I subscribed to this little User Group where some of the members wrote their own software and sold it for a few quid through a monthly newsletter. I don't know why but each time that newsletter arrived, I would scour it for any new software that I didn't have and I'd always buy it. It wasn't always to play it either – some of the discs I bought haven't even been in the disc drive. But I wanted to encourage people to write software for the machine that I'd spent my money on and it felt a bit special to be playing games that only a few people had ever seen. When others were playing *Barbarian*, I was trying to solve a humungous text adventure called *Rally Adventure*. Finally the newsletter ceased and I did upgrade to a better machine. But I could never quite let go of the discs.

"Probably these are some of the only copies of these games that now survive. I'm glad you might be able to preserve them for future generations. It makes me feel as if somehow there was a reason that I made that bad decision to buy a Dragon."

Just three weeks later, and with a lot of help from Roberto Gerhardt of the Dragon Archive (**archive.worldofdragon.org**), these discs, which contained many hundreds of long-thought-lost programs, are now taking their rightful place in cyberspace.

In the rough and tumble of reviewing 'new' software released for old machines, finds such as this often get overlooked. There is little fanfare to their release, just a forum post or two, on sites that only those who once owned the computer in question are likely to frequent. Yet all of these programs were once someone's labour of love, with no less passion involved in their creation than the very games you are about to read about in this article. Some of these games are also just as advanced.

The newsletters of old, which I remember well, were the Internet of the Eighties generation. And, as this story shows, this generation is a sentimental bunch; years later it is still programming those very machines, archiving 'lost' programs it finds and even still selling the games it manages to create. Perhaps not in any great numbers, and perhaps only to those who want to collect them rather than play them, but this slightly niche, and somewhat eccentric, world continues to thrive – with collections being built up in exactly the same way as they have always been.

This month, the Retro Round-up goes creepy. It's got zombies, it's got ghosts, it's got robbers, it's got balls and it's got pussy. *I beg your pardon?* Yes, well, I dare you to read on…

Here Come The Zombies

Available at last, Relevo Videogames' *Invasion Of The Zombie Monsters* has been a whopping four years in production and has finally been released with slightly different versions for the Amstrad CPC, Spectrum and MSX. It's been reviewed elsewhere and given lavish amounts of praise. Alas, I don't like it.

The cover art for Zombie Monsters is cool, and lots of thought has gone into the game

However, run-and-gun games work better when the character is kept to the extreme left of the screen

▲ *It's Yumiko's cover art. Do I believe this game is PEGI-rated 12? Hmmm, let me think about that one...*

▲ *When the screen is lit up by lightning, you can see a ghost watching your every move...*

You play Ned, who can run, jump, crouch and shoot in a game that is incredibly similar to the classic *Ghouls 'N Ghosts*. It has the difficulty level to match that game too. In fact, it's practically the same game, with exactly the same issues that plagued the original.

The three versions of it are slightly different-looking, but all do look very nice. Graphics are amazing, music is cool and character and background design is inventive. The physical versions also come supplied in a snazzy, professionally printed box with a manual and cassette/disk to match.

All that seems very promising. Until, that is, you start to play it. Because *Zombie Monsters* is not a question of simply avoiding or shooting the numerous monsters; you must also remember the layout of the stage itself.

The game involves Ned running from left to right; the screen scrolls (jerkily) when Ned reaches the centre of it. Zombies, however, appear from the right, often on a collision course with him. If you keep Ned running, he'll collide with them faster. If you don't, then you have only a half-screen's reaction time between seeing them and needing to hit them with the release of a well-timed bullet.

If you do successfully shoot a zombie, it explodes in a ball of flames. However, some of them require more than one hit and therefore may require Ned to run away from them first and then turn around, simply to be assured of having the time to fire off the requisite number of shots.

Zombie Monsters also involves the *Rick Dangerous* style of gameplay, whereby you have to become intimately acquainted with all of its stages in order to clear them. Unless you have a photographic memory and can remember exactly what zombies are about to appear at which points of the game, you end up running away from practically every zombie that appears – then gently nudging Ned to the right rather than running. Combining the two elements, you end up treating *Zombie Monsters* with too much trepidation.

> **Zombie Monsters is not a question of simply avoiding or shooting the numerous monsters; you must also remember the layout of the stage itself**

The easiest way of surviving is to take very small steps to the fire, whilst constantly firing in case a zombie is going to appear...!

My instinct says that this is not the game that Relevo Videogames set out to make. Because, even employing such a strategy, the game is tremendously unfair. When it knows you will be at your most distracted, i.e. busy jumping from one bridge to another, it chucks a load of ducking and diving monsters at you to make the operation as hard as possible.

There's also the "eight pixels at a time" scrolling. This is a real passion-killer, with monsters and bullets (whether fired by you or the monsters) glitching rather than flowing across the screen. Contact with either of them leads to an inevitable death and, on many occasions, although I did hit the jump key, Ned was hit before he reacted!

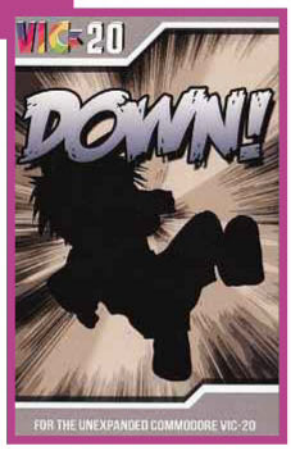
When you die, you're sent all the way back to the beginning of that stage. So the sad reality of *Zombie Monsters* is that most people won't see further than the first stage unless they enable a cheat. A game does not need to be this challenging; if Ned could withstand three hits before dying, for example, this would have resulted in much less swearing and tearing outof my hair.

Finally, the manual for *Zombie Monsters* appears to have been translated directly from the original Spanish to English and – in not the only example of this phenomenon – it drones on for many pages rather than just summarising the game as a run-and-gun sideways-scrolling platform game with cutscenes. In fact, the concept is so simple it really doesn't need a manual, period.

If that diatribe doesn't put you off, though (and bear in mind that, according to the Internet, I'm the only person who doesn't like this game), you can download it from Relevo Videogames' website at **tinyurl.com/pk5yudx** and give it a go for yourself. If you're a sucker for a physical version, these are available too – though they are somewhat hidden away at **www.sellmyretro.com**, but can be brought up by doing a search on "invasion".

Ghostly Goings-on

The first Spectrum game this month is the product of a publisher we have not seen before. *Yumiko In The Haunted Mansion* is an overhead maze game for the 48K version of the machine, and the object is to roam 36 floors of a mansion with only a candle for company lighting it up as you go. The candle you carry casts a light in an arc around you, meaning you can gain an appreciation of all



Down!'s cover art is a respectful nod to the original

The ball must be rolled so that it falls through the gaps on a screen that scrolls vertically

open and closed spaces. However, and as you'll see from the screenshots, the majority of the screen is completely jet black. It's dark – and you're alone. Well, almost...

More terrifyingly, every few moments the entire maze is temporarily lit by a flash of lightning. What's that ghostly-looking thing a few steps beyond the candle's reach? The answer is the very definition of the word eerie.

Unfortunately for a game that looks so promising, playing *Yumiko* is decidedly dull. Your only goal is to light each of the candles on every floor and you have a map to reference where the candles are. The ghost never actually does anything other than freak you out the first time you see it; whether it's there or not makes no difference. It never attacks, just wanders around blowing out the candles you have already lit.

The game is available from Fun Forge on original cassette at £8 while stocks last (E-mail: **retrozx@gmail.com**), or can be downloaded from World Of Spectrum. To see the game in action, visit **tinyurl.com/nr9x2yw**.

The Vic-20 Revival

Commodore's Vic-20 had only 5K of memory, with only 3.5K of that being programmable. Whilst, once upon a time, this was seen as a limitation, it's now seen as a challenge. To prove the little Vic capable of equally competing with its contemporaries, programmer Martijn Wenting has added a range of Vic-20 games to his website at **www.revival-studios.com**, which are now available as both digital downloads or physical cassettes complete with cover art and snazzy logos.

The first of these is *Down!*, a vertically scrolling platform game in which you must navigate a robot-looking ball through gaps in the platforms. The game is rather like a very simple mobile phone application; as the game speeds up, there is less and less time to react. On some of the platforms you'll also find a bonus, which you can grab for bonus points only if there is enough time.

There's no back story to this game and, frankly, there doesn't need to be. It's so simple your grandma could probably have a fair bash at it.

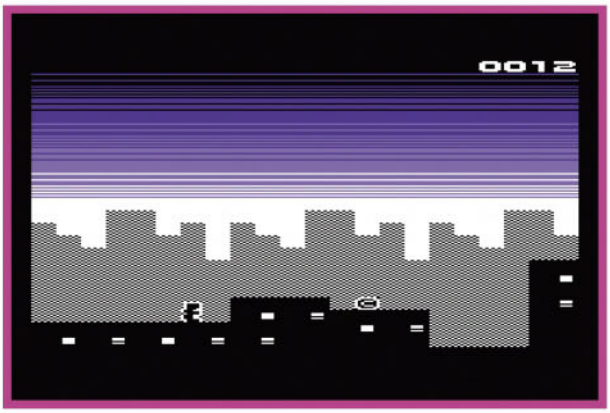
The second game is *Rush*, which is a horizontally-scrolling game which is actually pretty much the same sort of idea. Albeit *Rush* features a parallax (background scrolling at a different speed to the foreground) scrolling cityscape. You are in control of a bank robber jumping across the rooftops of the city by means of the joystick and fire key. Again, the objective is simply to survive as long as possible. This means timing your jumps correctly so as not to fall between the buildings. Leftover cash can also be grabbed.

Both games are written completely in assembler and, considering the miniscule amount of memory the Vic-20 has, are fairly accomplished works. With every byte being of the utmost importance, there was little room for loading screens or on-screen instructions in Vic-20 games of old, but Revival Studios has managed to include these more professional features by 'shrinking' them down. Instead of a loading screen, it therefore displays a small but impressive logo of the game's title - and by redefining the character set, it manages to get its own logo and a high score feature in there too, though you may need a magnifying glass to see them!

Down! has something of a stretched appearance, and the large empty blue spaces in the background don't give the game much ambiance. Despite being in exactly the same resolution, as you'll see from the screenshots, Rush clearly looks a lot better. However, there's a big 'but'. Revival is currently asking £10 per cassette, and £4 per download, for *Down!* and *Rush*. Put simply, unless you are a serious collector of Vic-20 titles, they're just not worth that much. After ten minutes you'll be bored by both of them.

Rush follows the trend for Revival's box art

Rush is a very simple idea, as most Vic-20 games have to be!



Darn, and my quantum gardening was doing so well - until I rolled an infestation of snails upon my plant!

It's the awful cover art for the game with an awful name

This is an awful cut-scene from a game with too many of them

If you can get past the name, the actual puzzle game is a blinder!

The Stupidest Title Ever

One of the many things we all learned from recent retro-gaming documentary *From Bedrooms To Billions* was that merchandising sells games. Write a game called *Jungle Safari* and you'll get 10% of the sales it would garner with the title *Predator* and Arnold Schwarzenegger on the cover art. Fact. Another fact: merchandising is a double-edged sword. A brilliant game can suffer poor sales on the back of a lousy movie.

Yet, never have I seen merchandising as downright weird as this month's final release. I'm about to describe a great game for the Spectrum 128K – a splendid platform-based puzzler with music, graphics and presentation that is of such high quality that, were it not for its merchandising, it could take pride of place in that collection of rare new Spectrum games you've been building. That game is called... (Drumroll please) *Pussy: Love Story From Titanic*.

Yes, you read that right. This game is called *Pussy*, with all of the connotations of that word implied by its position in the title. That has probably put off over half of its potential audience right away, leaving behind only the bewildered and the fans of *Sex Olympics*. The latter are also going to be disappointed as the game includes none of that business at all.

I therefore award *Pussy* a completely fictional award for 'Stupidest Title Ever for A Puzzle Game' and, amazingly, it gets even worse. According to the overview, you play Leo and, in each stage, you need to rescue Kate who is entombed in a grid of blocks – yes, blocks – that you must smash out of the way. The background shows a nice rugged mountainous terrain.

There's no seafaring, or anything water-related in this game at all! Indeed, without the inlay overview – or the badly digitised stills from the movie *Titanic* punctuating the action – you'd have quite simply a puzzle game. A great puzzle game, but not one illogically disconnected with a barking mad title plus an invented back story.

Sealing the puzzling deal is the box art – where the official promotional artwork for the Leonardo DiCaprio/Kate Winslet movie *Titanic* is overlaid with *PUSSY* splashed across in place of the actual title. Yes, really, I'm not making this up (it's up there in the top left corner of the page, look). The whole appearance of the software looks like something you'd be offered out of a briefcase by a suspicious-looking Chinese guy outside your local Tesco!

What's so infuriating is that the game is fiendishly good. It requires swift reflexes and a great deal of thought to position Leo in the exact place he needs to bash out the blocks that solve each puzzle and allow Kate to safely drop into his arms. Even by stage four, the puzzles presented have only one simple – and not immediately obvious – solution. The control of Leo is fluid and all the little touches make it a joy to play. Some of these touches are bouncing passwords, bonus razzmatazz and music so good that it's hard to believe it comes from a Speccy!

So, if Fun Forge stripped out the totally irrelevant *Titanic* cutscenes (which also weigh in at about an hour's loading time on cassette) and changed that ridiculous title, I'd be roundly congratulating them on one of the best Spectrum games ever made. Instead though, I'm just royally confused by why it's coupled with this bizarre merchandising. I suspect Director James Cameron had zero hand in the game and so I just don't see the point.

My recommendation: by all means invest in the physical package and relegate it immediately to 'that drawer' in your bedroom. But play it only via emulation, enable all tape load speedup hacks and hit space to skip every pointless cutscene. To Fun Forge I say this: Keep demos separate from games in future. To whoever thought of that title, I say simply grow up.

Pussy: Love Story From Titanic can be viewed in action at **tinyurl.com/p23r2pa**.

Fun Forge (members.inode.at/838331)		
Pussy: Love Story From Titanic	Spectrum 128K	£15
Yumiko In The Haunted Mansion	Spectrum 48K	£8
Revival Studios (www.revival-studios.com)		
Down	Unexpanded Vic-20	£10
Rush	Unexpanded Vic-20	£10
Sell My Retro (www.sellmyretro.com)		
Invasion Of The Zombie Monsters	Spectrum 48K	£15

Next Month: The Dragon Roars

Pussy rounds off a very odd selection of games indeed this month.

Next month should see a fair few column inches devoted to that library of newly recovered Dragon 32 games. Can't wait that long? You can watch the archiving process as it happens over on **www.dragon32universe.info**. Otherwise, same time same place for all that's new in the world of the old. **mm**

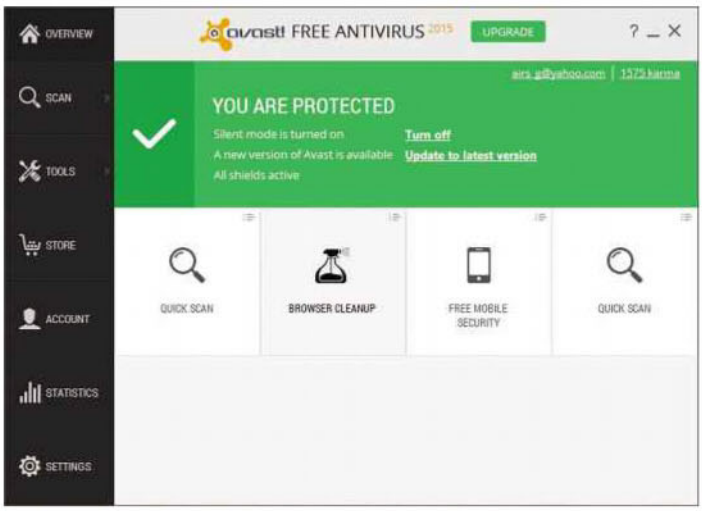
Dealing With Viruses

Aaron looks as the options available if your PC is infected with a virus

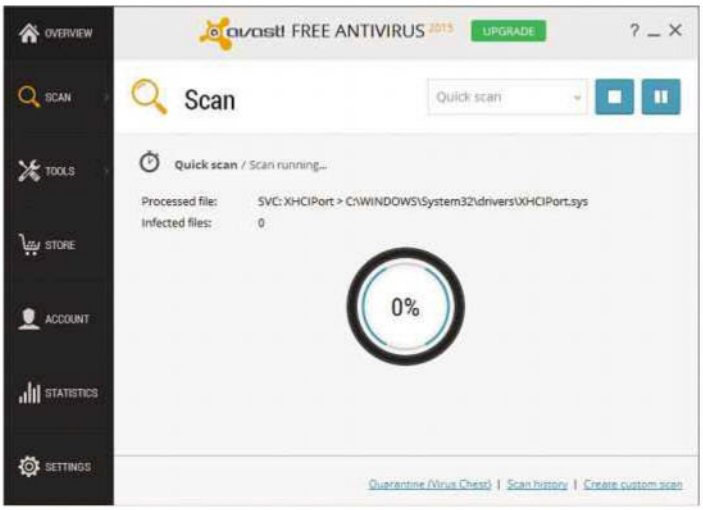
Fixing a PC when something goes wrong is sometimes easy, but often it can be a troublesome task, stressing users to the breaking point when they find themselves stuck and with no idea where to turn – other than paying someone else to fix it. However, error messages and hardware problems are often far easier to fix than one of the most difficult problems a PC user can face: a virus.

Unlike normal day-to-day errors or hardware problems, which usually provide some form of error message or symptom that can easily be identified, viruses often go out of their way to hide themselves. Often users don't even know they have a virus, and even if they notice a possible infection, identifying exactly what the unwanted visitor is can be very challenging (getting rid of if even more so). Many viruses are designed to not only hide their presence, but take steps to actively resist any efforts of removal. This can include, but is not limited to: disabling security software, preventing access to Safe Mode and messing around with Windows' GUI. Some can be particularly nasty in this regard; while others can be easy enough to remove, they're just so hidden you may never know they're there in the first place.

So, what can be done should your system become infected with a virus? There are plenty of options for those needing



Whatever your anti-virus software may be, ensure you use it on a regular basis



Scheduled scans can be a big help and will scan your PC on a regular basis for you

to clean their PC, both automatic and manual, which we'll take a look at here. As well as acting on threats and detected infections, we'll also take a look at some proactive options, techniques you should employ to stay clear of viruses and nip any problems in the bud before they blossom into full-fledged attacks. So, let's begin.

Detect And Identify

The first step to removing a virus is detection. If you don't know a virus is there, you won't even know you need to take action. It's for this reason that you should always run regular virus scans of your machine. These scans will reveal many infections if you have them and will prompt you to take action.

You can run scans manually, but as it's best to run regular checks, so setting your anti-virus software to scan using an automated schedule is a better idea. This also lets you schedule scans to run at times when you're not using the PC. This is good as it's best to leave a PC alone when files are being scanned for the most part and many scans can also slow down PCs quite drastically, especially if you're running and full, deep scan. Scans can also take a long time.

With luck, scans will turn up clear, which means that you have no problems to worry about – theoretically, that is. Not all virus scanners are created equal, though, and some may miss what others do not, so just because your installed anti-virus program gives you an all clear, don't instantly dismiss any concerns you had in the first place. It may be a good idea to get a second opinion. This can be a problem, though, as it's generally not a good idea to have more than one anti-virus suite on your PC at any one time, as they usually don't get along too well. You can, however, use various online scans, such as bitdefender (**www.bitdefender.com**). These can scan your PC without being installed and will give you a good alternate opinion on your PC's virus-related status.

Also, as well as the kinds of infections anti-virus programs can detect, there are other malware infections they cannot, which is why you need to ensure you run some form of malware scanner

> **If you don't know a virus is there, you won't even know you need to take action**

for your system too. These check for various threats, such as adware-related problems and can remove them from your PC. Malware can be just as troublesome as a virus, but acts in a different way. It also functions differently and gets on to your system in a variety of different ways, so can slip through the net if you don't use the right tools.

Unlike anti-virus apps, most malware scanners won't be affected by the presence of more than one similar tool, so it's easier to run multiple scans for a more thorough sweep of your PC. Malwarebytes (**www.malwarebytes.org**) is one of the most popular, free malware scanners, but there are many others, free and paid for, including Spybot (**www.safer-networking.org**) and SuperAntiSpyware. As well as simple scanners, you can also use more specialised tools, such as the powerful Combofix (**www.combofix.org**) and HijackThis

Bitdefender's online scan is a great second opinion scanner

Malwarebytes is one of the best malware scanners, but you don't need to limit yourself to a single program

(**free.anti-virus.com/us**). These tools perform deep scans of your PC and can produce complex log files afterwards. These log files are then used to diagnose infections, allowing users to remove infections manually. In many cases, these log files may contain information that inexperienced users won't find all that useful or understandable, but this can be shared with experts online, who can help diagnose and fix any problems. HijackThis, for example, is now owned by McAfee, so online support is readily available and both programs are catered for in various independent, speciality forums.

Removal

So, you've run various scans or used tools like ComboFix to produce information about a virus. What now? Removal is your next task and this can be the most difficult, depending on the virus or other malware infection you have. If you're lucky and you've got one of the many viruses that are simple and easy to remove, your virus or malware scanner will probably be able to quarantine and remove it for you. However, if you have a nasty virus that won't go down without a fight, things can get a lot more difficult, which is where tools like ComboFix and HijackThis really come into their own.

These provide the information to identify troublesome viruses and this helps those with more knowledge of viruses provide help to remove it. This help will vary from virus to virus, so we can't provide exact steps here, but there are some common techniques and tips you should know about that can help if you have a nasty guest to remove from your system.

By far the most useful tip we can offer you is to make full use of Safe Mode (as long as your virus doesn't prevent this). Many viruses can mask their presence in system-style files and will hook into files that cannot be removed during a normal PC's operation. This creates problems for virus removal tools, as they can't properly remove the infection. Some will advise a reboot, at which point this removal will be attempted, but it's not always successful. If you're manually removing a virus, this kind of problem can be even more troublesome. Booting up into Safe Mode prevents a lot of system-level files, drivers and other software from running as normal, so it greatly limits the power of a virus to stop you.

On pre-Windows 8 systems you can get into Safe Mode by tapping F8 during boot up and selecting the option from the boot menu. For Windows 8, you need to employ other methods, including setting Safe Mode using the System Configuration Tool (Press Windows+R and type 'msconfig', then go into the Boot tab) or you can press and hold Shift as you click Restart. You'll

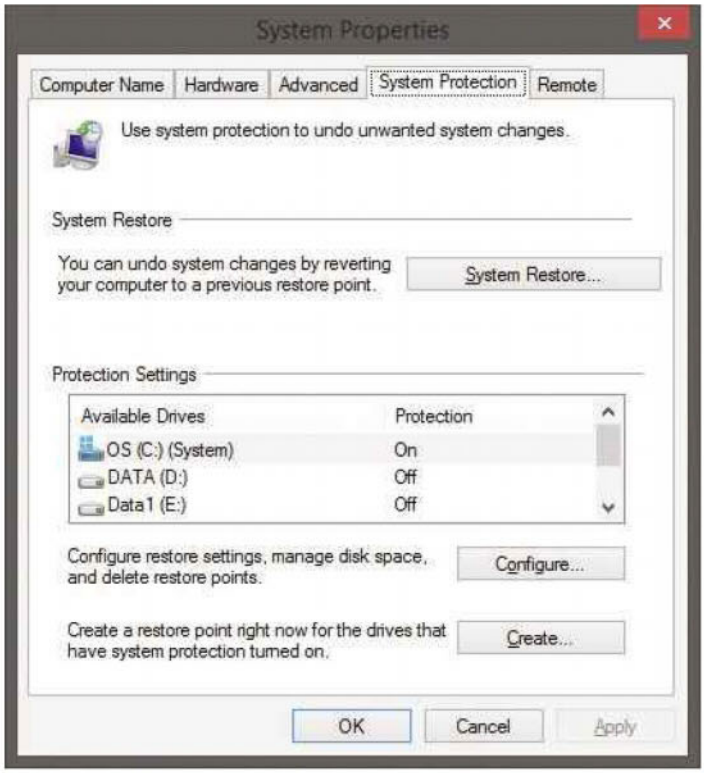
Safe Mode is one of your best weapons in the fight against viruses

then be able to chose Safe Mode from the Troubleshoot menu by going to Advanced Options > Startup Settings. When the system Reboots, you'll be able to select Safe Mode by pressing F4 to enable it.

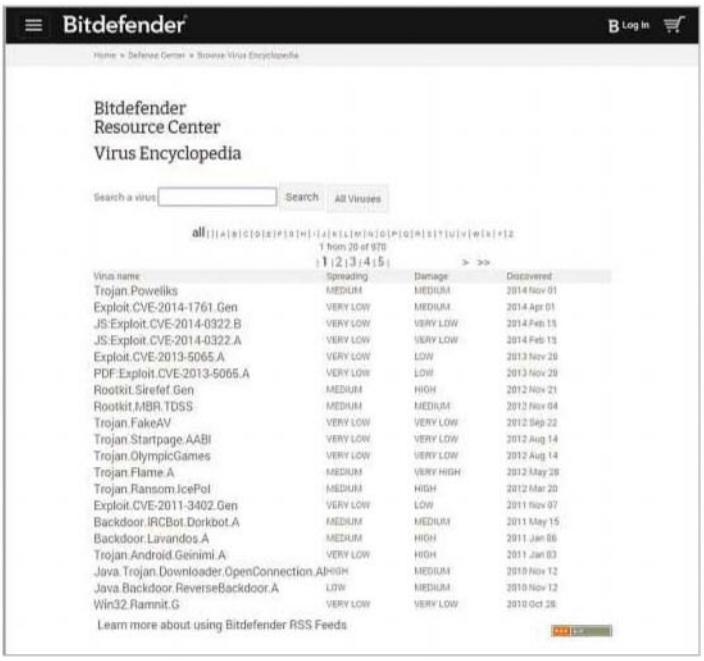
Once you're in Safe Mode, you'll be able to perform specific steps required to remove certain viruses, such as deleting infected files, removing Registry entries, turning off specific services, running virus cleaning tools and so on. Most of the time, a virus will be powerless to stop you.

We'd also advise that you regularly run your anti-virus and other scanners in this mode too, as they can be much more useful and thorough when run in Safe Mode, as there are no restrictions on many of the files they need to scan when running in this mode.

Another tip to keep in mind is System Restore and its impact. While system Restore can be a very useful tool, when it comes to virus removal it can actually be more of a hindrance. Sometimes virus infections can be hidden away in an old system restore checkpoint, threatening to return if you ever use that particular image. Other viruses, aware that they can be removed



System Restore is a useful tool, but can cause problems of its own when it comes to viruses



Bitdefender's encyclopedia of viruses is a very handy resource

by using System Restore, disable it. Either way, it's a tool that can represent a problem. If this problem relates to the former example here, it's a good idea to deactivate System Restore, as it can also take a restore point automatically while you're trying to remove a virus, which will have obvious ramifications. It's also worth deleting any restore points you have that may overlap with the virus infection.

> **"There may come a time when there's no other option but to take the last ditch solution – a format"**

You can access System Restore in Windows 8 by typing 'recovery' into the search tool. You can then select to open System Restore to use it or configure System Restore to change it's settings and disable/enable it.

Manual removal of a virus can often mean sifting through your computer's hard disk looking for infected files. The best way to find these files is to use the Internet and search for the name of your virus or any infected files picked up by your virus scanner that couldn't be removed automatically. Searching for these file names will often provide guidance on how to remove such items from techie websites or specialised forums.

With the sheer number of viruses out there, this is one of your best tools and the online community is a great way to seek help for the removal of a troublesome virus. It's also a good idea to visit various anti-virus software vendor sties, such as Symantec, McAfee, Bitdefender, Avast and so on. These companies create anti-virus tools, so are a good source of information regarding possible infections and their removal. A great example of this is Bitdefender's Virus Encyclopedia, which you can find at **bit.ly/1cGYBCh**. This is a searchable database of viruses, so it should be easy to track down any known infections and get help.

Often, you'll need to use a collection of programs to remove specific types of viruses, again, these programs should be run in Safe Mode. You'll find all sorts of sites recommending various steps and software to use, but the truth is there's no one real trick to it. It's all down to preference, the virus you're infected by and what works at the time.

For example, we've seen specific guides that recommend you use Safe Mode, Kaspersky's Tdsskiller, Malwarebytes, Hitman Pro, AdwCleaner and Emsisoft Anti-Malware in a specific manner to remove browser redirects. This is all good advice and will work very well, but it's not a process that will work any better than someone else's suggestion that involves a different approach. Whatever works, works, so if you've already got some security software installed, give that a go first before you start downloading and installing a whole host of additional software. If your current configuration doesn't get the job done, then it may be time to look for another solution.

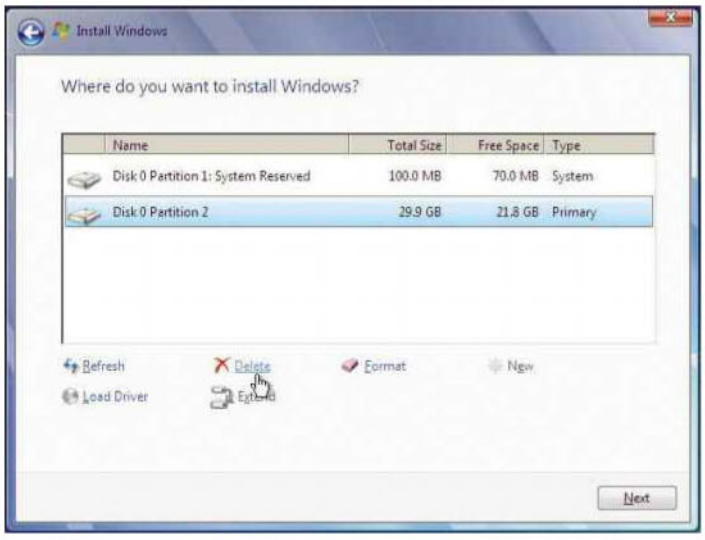
Finger On The Button

Of course, even with the best will in the world and all the tools at your disposal, there may come a time when there's no other option but to take the last ditch solution – a format. Some viruses can be so nasty to remove, that many choose to take the most drastic measures to ensure they're gone. That means starting again by formatting your machine.

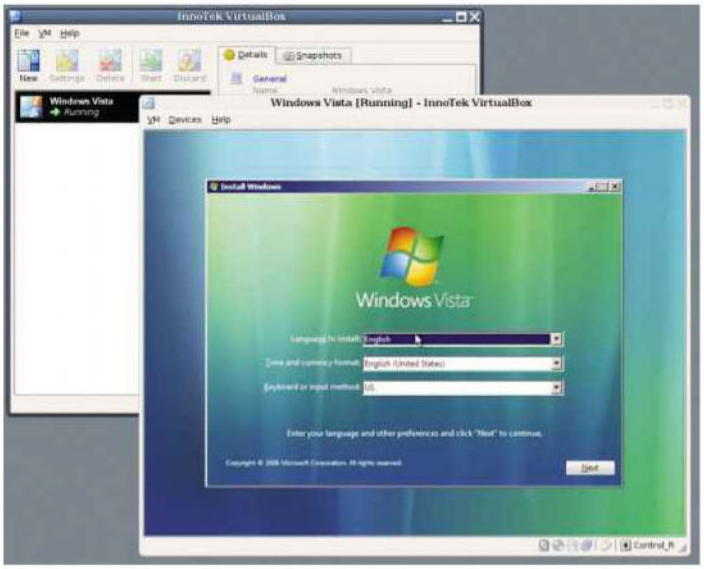
These may seem harsh, but in some instances, it can actually be a far easier and quicker way to remove a virus than the usual steps taken to remove it. It also gives a user much more peace of mind that their system is truly clean, safe and secure once again. In fact, thanks to PC imaging and cloning, it's become a common practise in corporate IT to format a machine instead of attempting a removal, as support departments can rarely afford the time and effort it takes to manually remove viruses from a machine. As many businesses have PC images stored and ready to go, it's far more cost effective to simply start again.

Other options, such as a clean install or repair are an option here too and could possibly work, but when you're dealing with viruses, the locations of which could often be largely unknown, keeping any data or old system files from the existing installation could be a risk, leading many to prefer to go for the total format.

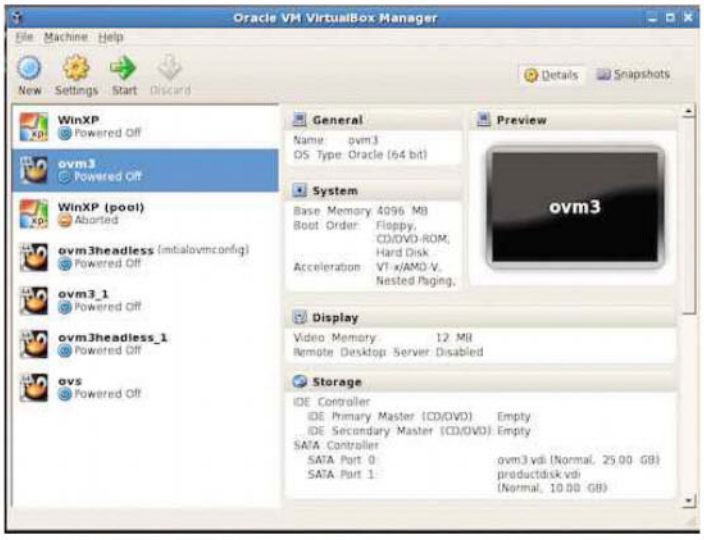
The main problem with this approach is the possible loss of data and if you've not backed up your files beforehand, you really should spend a good amount of time making sure you do. It's



A format and reinstall is sometimes the best or even the only option



Virtual machines can function as a safe area for using new programs and browsing the Internet



Virtual machines can use a lot of resources, but these can be scaled

best to do so on a regular basis, as you'll be sure you have a safe copy of any data that's untouched by a virus, but if needs must, try to back up data from the infected machine too. Just be sure you thoroughly scan it on any other machine, just to make sure it's clean and clear of threats.

Once you've backed up your data, you can format and reinstall from your original disc or system recovery image. Once this is done, you'll have a clean, virus-free system, ready to go. You'll now want to take the first step of installing a good anti-virus and malware app, to ensure your PC is safe in future and to scan your backed up data again. It's better to be safe than sorry, after all.

Avoid The Hassle

It's easy to look back with hindsight and say you should have done things differently and it's also very true. Although there's no way to stay perfectly free and protected from viruses, you can improve your odds substantially by taking simple precautionary steps.

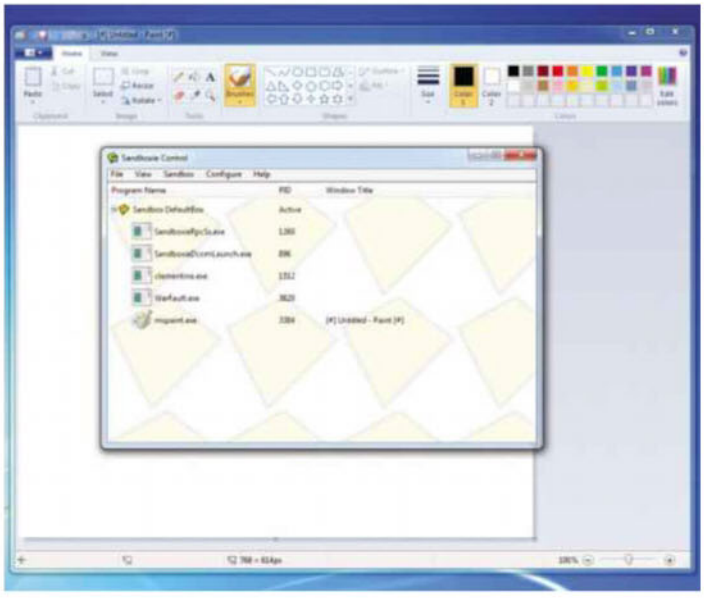
We've already talked about running regular scans with anti-virus and malware apps and this is something everyone should do – and do so on a regular, preferably automated, schedule. This is one of the best ways to keep your system protected. Also be sure to keep your security software up to date, including any virus definitions. This is usually automatic, but make sure this option is enabled in your programs.

Other methods include simple common sense and precautions. The Internet is a big, big place, but like any real-world city or country, there are places that should be avoided if you want to stay safe. Some sites, usually those that – how shall we say – skirt the boundaries of the law, can often be a hotbed for viruses and other threats, so it's important to be aware of this and try to avoid troublesome sites. Illegal downloadng, music downloads, pornography and so on are all areas of the web that have proven to be dangerous.

It's also important to be careful when downloading software, especially trial or free programs. Many such programs can harbour viruses or more commonly, adware, so always check that you're downloading from a reputable site and pay close attention to software installations to make sure you don't accept any additional software you don't want. If a program offers a custom install, select it and check the list of components doesn't hide any unwanted extras.

> **"Always check you're downloading from a reputable site and pay close attention to software installations"**

Another way to protect yourself online is to make use of virtual machines. We've covered these at length before in *Micro Mart* (you can find evidence of it via our website), but basically they're software-based virtual PCs that run an OS install within your main OS and function just like any other system. The difference is that, because they're a self-contained PC image, which is basically a large file on your PC, they have no reach to areas outside that file (i.e. the Windows install hosting them) so anything that goes on in the virtual PC, stays in the virtual PC and the whole thing can



Sandboxing is a good alternative to virtual machines and is easier to use

Most recent viruses				
Name	**Type**	**DAT**	**Risk**	**Date Discovered**
RDN/Generic.grp!hy	Trojan	7586	Low	03/03/15
Generic PUP.x!47D5B92EC2DE	Program	N/A	Low	2/26/2015
Generic Downloader.x!C3BE171842B5	Trojan	N/A	Low	2/26/2015
RDN/Generic BackDoor!bbv!681E8DE9F748	Trojan	N/A	Low	2/26/2015
Generic.bfr!6EABCAE20244	Trojan	N/A	Low	2/26/2015
RDN/Generic.bfr!id!89DA4F0B9AFE	Trojan	N/A	Low	2/26/2015
RDN/Generic BackDoor!bbv!63D0D36E010A	Trojan	N/A	Low	2/26/2015
Generic.dx!9DA85BB0FFAB	Trojan	N/A	Low	2/26/2015
Generic FakeAlert!E35608C04D28	Trojan	N/A	Low	2/26/2015
RDN/Generic.tfr!ei!40A74770E65E	Trojan	N/A	Low	2/26/2015
RDN/Generic.tfr!ei!57CF1966A13B	Trojan	N/A	Low	2/26/2015
RDN/Generic.bfr!id!744B66331525	Trojan	N/A	Low	2/26/2015
W32/Spybot.bfr!0391BECB1EFF	Virus	N/A	Low	2/26/2015
RDN/Generic.dx!64703124682A	Trojan	N/A	Low	2/26/2015
RDN/Generic PUP.x!C3C9518B2E91	Program	N/A	Low	2/26/2015
Generic.bfr!AC16DBD5D6E8	Trojan	N/A	Low	2/26/2015
RDN/Generic.bfr!id!3A6E60A6E410	Trojan	N/A	Low	2/26/2015
RDN/Generic.tfr!ei!2DD5F2DB4CCF	Trojan	N/A	Low	2/26/2015
RDN/Generic PWS.y!FA849BA90082	Trojan	N/A	Low	2/26/2015
Generic Downloader.x!3F5003F05153	Program	N/A	Low	2/26/2015
RDN/Generic.dx!djn!3316DFE3E56C	Trojan	N/A	Low	2/26/2015
RDN/Generic.dx!djn!3104020682F0	Trojan	N/A	Low	2/26/2015
RDN/Generic BackDoor!bbv!3B3C64828E7B	Trojan	N/A	Low	2/26/2015
RDN/Generic BackDoor!bbv!4882A71A6585	Trojan	N/A	Low	2/26/2015
RDN/Generic PUP.x!0AF6343C4EAB	Program	N/A	Low	2/26/2015
RDN/Generic.bfr!id!26DB9531DF97	Trojan	N/A	Low	2/26/2015
RDN/Generic.dx!djn!3BAFE3140147	Trojan	N/A	Low	2/26/2015
Generic PUP.x!DDE5C72A8342	Program	N/A	Low	2/26/2015
Generic PUP.z!F996094B0BA4	Program	N/A	Low	2/26/2015
RDN/Generic.bfr!1A1B5134B133	Trojan	N/A	Low	2/26/2015

be deleted and replaced with ease. That means that if you're using a virtual PC to browse the Internet or try out new software and you're attacked by a virus, you can simply delete the whole virtual OS and replace it with a new one. Easy.

This approach makes a great test bed of sorts, so you can safely try out new software virtually to make sure it's okay before you install and use in on your real, physical PC. The only real drawback to this approach is the need for another copy of Windows, as it requires a licensed OS. If you have a spare copy or an older copy of Windows lying around, though, you're set.

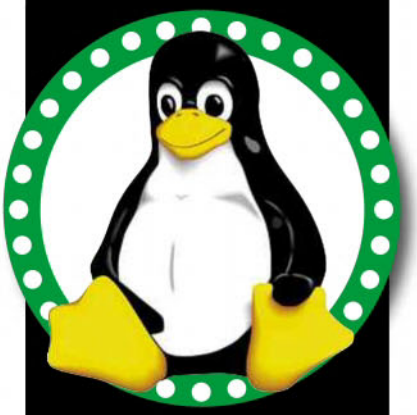
A couple of example virtual free PC programs you can use include, VirtualBox (**www.virtualbox.org**) for Windows and QEMU (**wiki.qemu.org/Main_Page**) for Linux. VMWare (**www.vmware.com**) also has trial versions and is a good solution. Pay attention to the technical requirements too, as running a virtual PC can tax a PC and you need to reserve and assign your PC's resources to the virtual system.

If the virtual route is a bit complicated for your taste, you don't have a PC capable of running it or a spare OS, then you may want to try sandboxing. This technique is a little easier to use than visualisation and it's popular among home users who want to stay safe and secure.

Simply put, sandboxing is a method of isolating specific programs so that they run in a protected space. They're kept away from the rest of the PC, including system files and shield you from any problems. You can run any program like this, including Internet browsers and downloaded programs you've not used yet, so can't be sure if they're safe. One of the best sandbox tools to use is, quite fittingly, Sandboxie (**www.sandboxie.com**). This is a free sandboxing solution that can quickly and easily isolate your programs so you can run them safely. It's a great way to browse the Internet without worrying and you don't need powerful hardware or another OS license to make use of it.

Disinfected

As long as you're careful, it's possible to avoid most problems relating to viruses, but it's by no means a threat removal. Viruses are always evolving and those who write them are constantly trying to circumvent security measures that are put into place. For this reason it's important to keep up to date, ensuring your security software is kept current and your system is scanned on a regular basis. Follow some of the tips we've gone through here and you'll have a much easier and virus free PC experience. **mm**



Farewell Mandriva

A distro lost and hot-plugging

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

It was sad enough a few weeks ago to report on the loss of a Linux distro, but this week's Linux News is especially bad, as one of the community's oldest distros has finally closed its doors for good.

Mandriva has been around for a good 17 years, offering Linux beginners an alternative desktop away from Microsoft. It's had its fair share of ups and downs; it managed to secure itself as the desktop OS of choice for Nigerian schools some years ago, but there were times when the company was running at a loss.

Mandriva CEO, Jean-Manuel Croset, helped the company gain some of its former footing, by boosting revenue by about 40% in 2014 following a particularly bad year in 2013. The result of the 2013 loss in revenue meant that cuts had to be made, and staff were sadly laid off. But just as Mandriva was breaking even for 2014, the former employees sued the company to the tune of hundreds of thousands of euros.

This meant that the Mandriva coffers were empty, and shareholders didn't want to put up any more cash in order to save the company, thus forcing it into bankruptcy. As Croset told Business Insider, "Mandriva SA went out of business following a few court decisions upon action of former employees, who had been dismissed as a part of the restructuring process in 2013. As the labour laws are very generous towards the employees in France, those court decisions forced the company to announce bankruptcy, as the cash available was not sufficient to cover the amounts due, and the shareholders did not want to cover them .... I'm sad that Mandriva died in such a way."

So are we, Mr Croset. So are we…

> "You can indeed move the processing from one CPU to another"

Hot-plugging A CPU

A friend rang me up the other night in a frenzy, "How do I hot-plug a CPU," he asked from his work's server room. After a brief flap, he hung up saying, "Never mind. I'll work it out."

The call itself isn't surprising, considering it was from him. He once rang up in the middle of the night and asked how to put back together a supercomputer (he was contracting in Japan at the time), so him asking an odd question like this didn't surprise me.

What did surprise me was the fact that Linux already supports a CPU hot-plug feature. In all honesty, I didn't think such a thing was possible. But after following a quick tutorial on NixCraft, I discovered that you can indeed move the processing from one CPU to another by using several commands to disable/enable each individual CPU.

The process itself seems fairly straightforward, although I'll admit here that I didn't try it, as I no longer own a multi-CPU PC. Apparently, by entering the following as root, you can turn off CPU 6:

```
echo 0 > /sys/devices/system/cpu/cpu6/online
grep "processor" /proc/cpuinfo
```

Just change the number for the CPU of your choice. And to turn it back on again, you simply replace the echo 0> part with echo 1>.

If anyone has a multi-CPU machine, one that actually supports hot-plugging a CPU, will you let me know if it works. You can find the tutorial at **goo.gl/SelbRq**.

Until next week, folks.

The Right Type

Apple is reportedly about to update its system font again, but how much does that really matter?

Whenever Apple is set to make aesthetic changes to an operating system, its actions are inevitably divisive. Over the past couple of years, this has been especially apparent in the company's move towards a more minimal style, eradicating the majority of texture from iOS and OS X alike. Some people welcomed the newer, lighter, simpler interfaces, while others thought Apple had gone a step too far in emphasising content over visual flair, removing all semblance of character from its operating systems.

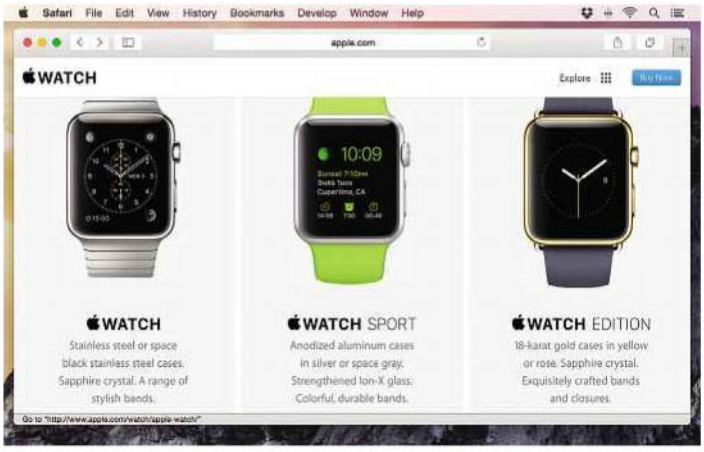
Rumbling from the rumour mill at the time of writing is the claim Apple is to perform upheaval of the typographic variety, dumping Helvetica Neue from OS X and iOS, replacing it with the font used on Apple Watch, San Francisco. This might seem an odd move, given that the Mac's only so far had a single year with Helvetica Neue (which in Yosemite replaced predecessor system font Lucida Grande), but it makes a lot of sense.

First, Apple's all about continuity across its brand. With its OS interfaces having so wholeheartedly embraced a kind of minimal, stark aesthetic (none more so than on Apple Watch, on which apps primarily display coloured text and very basic imagery over a black background), text comes to the fore. Having that text look broadly similar across smartwatches, smartphones, tablets, notebooks and desktop machines, further emphasises Apple's ecosystem as a single, unifying entity, rather than a bunch of disparate components trying very hard to communicate with each other.

Secondly – and more importantly – San Francisco was, according to Apple's own developer documentation, designed "specifically for legibility". The Type Detail website outlines some of the benefits the font offers (**typedetail.com/san-francisco.html**), most notably a large x-height that ensures legibility even at very small sizes. From a screen-based standpoint, this can't be said to the same degree for Helvetica Neue, which was never designed with modern devices in mind (although it's of course been tweaked for them).

Naturally, a quick trawl of forums sson finds plenty of supposed Apple fans claiming they'll never update any of their kit again should the company go through with its plans. They'll presumably tattoo HELVETICA FOREVER on to their foreheads, while battling on with iOS 8 and OS X Yosemite when everyone else is using versions of Apple operating systems so futuristic that they'll even manage to get iMessages in the right order. But then old hands have lived through such grumbling. They know that the world didn't end when the classic Chicago (created by design legend Susan Kare) was ousted by Charcoal in Mac OS 8. Then when Lucida Grande booted Charcoal out of the way in OS X, the Mac somehow soldiered on. And last year, Helvetica Neue's arrival in OS X Yosemite didn't in fact result in every Apple user hurling their Macs into a nearby canal and switching to Windows.

To be fair, it's easy to understand how some people might get a bit miffed when a system font changes. Since the dawn of computing, text has been the main thing we've interacted with, so your relationship with your computer is so often heavily based around your familiarity with its system font. But time moves on, and with the advent of more Retina displays and new devices with screen sizes ranging from those that fit on a wrist to those that may cover an office wall, legibility is key. San Francisco is therefore objectively a better choice, and it comes with the bonus of temporarily differentiating Apple from entire design industries seemingly addicted to Helvetica variants.



Helvetica Neue system text, Myriad Pro on the website and San Francisco on the watch. Time to unify?

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**

Dial M For Android

M is in and L is out at Google I/O 2015. Ian McGurren takes a look

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

It's a year since Google unveiled Android L, later renamed Lollipop, to fit with its sweet naming standard, and it has widely been received as Android's most mature, stylish and impressive revision to date. Often seen as a style underdog to iOS, the Material UI design language used since Lollipop has seen Android equal or even overtake its Apple rival. It wasn't likely that the following version would be quite so ground-breaking. Now, in 2015, at Google's annual I/O developer's congress, we get that following version, currently only known as M. What can it bring to the mobile table?

Android M won't be the game changer that Lollipop was, at least stylistically and visually. Those same people who saw little difference between iOS 7 and 8 will take umbrage here too, as M, like 8, is more about the refinement of its forebear. If you're hoping for a visual overhaul, it won't be found this year, nor will it likely be found next year either. That's not to say M isn't worth your time, because it certainly will be, especially if you have a handset released in the last 18 months.

Android Pay

Some will roll their eyes and see an Apple copycat, but those who have been in the green robot's camp for a while will know Google has been hammering away at contactless mobile payments for ages now, Google Wallet first appearing in Android 2.3 Gingerbread in late 2010. But sometimes the world needs the Apple kick to pay attention, so with Apple Pay gaining traction, Google has tweaked Wallet and NFC payments into the more friendly Android Pay. It remains much the same but has the advantage of not needing the app open any more, and it's able to work with fingerprint scanners too. Which leads neatly to..

Fingerprint Scanners

Yes support for fingerprint scanners is now baked in, hopefully leading to an uptake in the technology. That's not to say Google will be responsible for the quality of the hardware – users of the Galaxy S5 and Tab S will have likely turned theirs off, being shoddy compared to the S6 and iPhone iterations. Hopefully good, cheap scanners will come along, but in the meantime Google may find its software being blamed when poor hardware is at fault.

Project Doze

There's always a Project with every new revision: Butter, Volta and now Doze which, as the name implies, relates to device sleep. Love them or hate them, Apple has device sleeping states down to a power-sipping art, losing 1% or 2% overnight to a good Android device's 10% or so. Doze is Google's reply to this criticism, and it does exactly what many root apps, such as Greenify, already do, just baked in. Essentially it uses information from sensors to determine if a device isn't being used, and if it isn't, it cuts the power to all but the most important aspects. Don't panic: this includes messaging apps. If you've seen a Macbook's Power Nap, it's much the same idea.

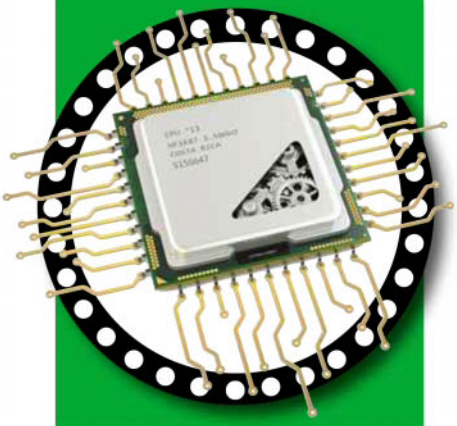
Now On Tap

Last for now is possibly the best too. Siri might have been 'first', but Google Now is recognised to be arguably the better digital assistant, especially with web-related questions and assistance. Now on Tap extends this with something like Amazon's know-all shopping technology Firefly or, less excitingly, contextual help. Press and hold home, and Google Now will pop up with contextual information depending on what you're doing. Chatting about films on Whatsapp? It'll bring up links, reviews and even showings. Listening to Spotify? Ask who drums in the band and it'll tell you, without you needing to say who the band is and without leaving the app. Impressive? Yes. Invasive? Possibly.

Android M, like all new versions, is available now as a limited feature developer's preview for Nexus devices and will see final release in the autumn with the next Nexus device(s).

Ultra-Hot GTX For Ultra HD

It's always worth waiting for the Ti version of Nvidia's top-end card, says Andrew Unsworth



I've probably mentioned it a few times in this column, but I've always preferred the Nvidia GeForce GTX 970 to the GeForce GTX 980. The reason for this preference is because the GTX 970 provides much of the power of the GTX980 but is much cheaper. The GTX 980 is a wonderfully powerful and power-efficient card, but I never felt it was sufficiently more powerful than the GTX 970 to recommend readers, friends and family. I felt much the same way about the GTX 770 and 780 too.

If, however, you must have a top-end Nvidia graphics card but don't want to sell a kidney to fund the latest GTX Titan, then it always pays to wait for the supercharged Ti version, and this time Nvidia really has announced something special.

Behold the GeForce GTX 980 Ti, a graphics card with more CUDA cores, more memory and more memory bandwidth than the standard GTX 980. The regular GTX 980 must 'make do' with 4GB of RAM, while the new GTX 980 Ti gets a much more generous 6GB. On top of that, the GTX 980 Ti's memory interface has increased to a width of 384 bits from the regular card's 256 bits, and the memory bandwidth has increased to 336.5GB/s from 224GB/s. The GTX 980 Ti's CUDA core count is a mighty 2,816, up from 2,048. All of this extra power shows that the GTX 980 Ti is very much intended for Ultra HD gaming, and considering that the regular GTX 980 is no slouch when it comes to moving pixels at ultra HD resolutions, it also shows that the GTX 980 Ti shouldn't become obsolete for quite a while.

Sadly, the GTX 980 Ti requires a six-pin and eight-pin PCI-E power connector combo rather than the two six-pin PCI-E power connectors of the standard GTX 980, but it's at least the same length and height. Even so, it's also still possible to drop the card into a PC with a relatively modest power supply, so chances are you won't have to stump up cash for a new PSU if you upgrade to the GTX 980 Ti from an older graphics card.

Nvidia's released a snazzy teaser video for the 980 Ti (**tinyurl.com/ntw92fg**) that to my eyes looks more Castrol GTX than GeForce GTX due to the silky smooth liquidity of the graphics, but it's certainly engaging enough to arouse my interest and loosen the straps on my wallet ever so slightly. No official UK price had been announced at the time of writing, but I'm sure it'll be competitive, especially with the AMD Radeon R9 390X on its way, and with the recent price drop of the AMD Radeon R9 295X2. I can't wait to see how the Nvidia GeForce GTX 980 Ti performs in the real-world, and I'm pretty sure nobody else can either. Pointless tribalism annoys me, but I do like competition, and I look forward to seeing AMD and Nvidia's next-gen high-end cards battling it out over the next year.

> **"This time Nvidia really has announced something special"**

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Revival Horror

The creators of Amnesia return with Soma, a terrifying excursion into an undersea industrial facility where robots think they're human

This week, Ryan checks out the latest indie horror games, and takes a look at Wildstar's move to free-to-play....

Plug & Play

While PlayStation 4 owners have recently been left reeling from the sudden cancellation of *Silent Hills*, Konami's sinister sequel that would have seen film director Guillermo del Toro team up with design legend Hideo Kojima, the horror genre is continuing to flourish on PC. The creepy indie game *Kholat* should be out on Steam by the time you read this – a moody, shadowy exploration through haunted Ural Mountains, it's narrated by Sean Bean and loosely based on the very real Dyatlov Pass incident, where a group of hikers vanished in the Ural Mountains in the 1950s.

Less icy, but no less chilling, is *Homesick*, a game that places you in a seemingly deserted tower block, left in ruins following some unexplained apocalypse. There are puzzles to solve and mouldering rooms to explore, plus an overarching mystery: what on earth happened here? Like the acclaimed indie hit *Dear Esther*, *Homesick*'s power lies in its minimalism; here, an abandoned building can tell you more about a game's world than a badly voiced non-player character ever could.

If you're after a more full-blooded brand of horror, then Frictional Games' sci-fi nightmare *Soma* has recently been dated for the 22nd September. Looking akin to an unholy marriage between *BioShock* and the studio's own *Amnesia*, *Soma*'s set in an undersea facility where something unimaginably horrible appears to have taken place. There are angry, screeching things skulking around in the shadows. Long-dead workers have left post-it notes warning you not to touch certain levers. And most worryingly, there are surviving robots who seem convinced that they're human. A 12-minute gameplay trailer (**youtu.be/syhcF0Mx0j0**) gives us the first proper look at Soma in action, and just watching it has left us feeling decidedly unnerved. In most mainstream horror games – including the aforementioned *BioShock* – the violence serves as a release valve. Games like *Soma* don't let us off the hook – they just leave us in a coil of tightly wound dread.

On the subject of *BioShock*, one of the most innovative-looking horror games on the horizon comes from one of the designers behind that watery shooter classic. Bill Gardner was once an employee of the now sadly departed Irrational, where he worked on such games as *SWAT 4* and *BioShock Infinite*. He's now set up an independent studio called The Deep End with several other ex-Irrational designers, and their first game is called *Perception*.

Aside from its typical mansion setting, *Perception* looks quite unique. It casts you as a blind woman named Cassie, who interprets the world around her by tapping a cane on the ground – doing so briefly illuminates the otherwise dark screen with details of your surroundings. The only problem is, the mansion's the home of something called the Presence, which will start hunting around if you make too much noise...

Currently looking for funds on Kickstarter (**kck.st/1FT0U7B**), *Perception* looks like another great example of the indie horror

Perception is a unique-looking horror game involving echo location, a mansion and a sound-sensitive demonic presence. It's seeking funds on Kickstarter now

The superb MMO Wildstar hasn't quite made the splash it deserved, but that could all change as it goes free-to-play in the autumn

games being made for PC of late: bold, intelligent, and as scary as hell.

Online

When *Wildstar* launched last June, it seemed to have everything going for it. Its creators, Carbine Studios, were former designers at Blizzard, and responsible for some of their most famous and lucrative games. Publisher NCSoft had clearly spared no expense when bankrolling *Wildstar*; the build-up to its launch was marked with a series of superbly animated trailers. The game itself looked colourful and zany – a welcome relief from the dire apocalyptic landscapes of most MMOs. The sci-fi planet Nexus, with its array of quirky characters and exotic technology, looked like somewhere you'd actually want to spend time rather than try to escape from.

It's the sign of a changing online landscape, perhaps, that *Wildstar* hasn't managed to get the numbers it deserved over the past 12 months. Despite considerable acclaim and positive word of mouth from those who've played it, *Wildstar* seems to have been struggling to find the audience it needs – NCSoft hasn't published official numbers, but players have been posting about sparsely populated servers on *Wildstar* for the past few months or so. With free-to-play MOBA games like *Defence Of The Ancients* and *Smite* garnering huge crowds, it seems that Carbine's traditional, subscription-based MMO has struggled to make itself heard.

This could soon change, however, as Carbine's recently announced that *Wildstar* is going free-to-play. It's a logical move, and could provide *Wildstar* with just the shot in the arm it needs – those who've already signed up for the game have frequently enthused about its athletic, buoyant action, and it's likely that the lack of an entry fee will entice others to try it and spread the word further.

"We [...] feel strongly that removing the subscription cost will give everyone who loves MMOs, or just wants to have an incredible gaming experience, a chance to try *WildStar*," Carbine says in a statement about the transition. And for existing players who fear that *Wildstar* will become a mangled, play-to-win shadow of its former self, Carbine have some further words of reassurance. While *Wildstar* will soon offer the usual in-game purchases, Carbine says "Progression will continue to require both skill and effort."

As with other MMOs in the past, *Wildstar* will still have an optional membership for those who want to carry on paying for it, which will provide XP enhancements, item drops and other perks for a monthly fee. Carbine also says that players that have supported Wildstar from the very beginning will get additional rewards for their loyalty. Though what that means remains to be seen.

More details of Wildstar's free-to-play transition will be rolled out before the change happens in the autumn. Done right, it could mark a positive turning point for an underrated MMO.

You can find out more at **www.wildstar-online.com**.

Incoming

After a 12-month hiatus, EA has big plans for its long-running *Need For Speed* franchise. As we heard last week, *Need For Speed* will be a reboot of sorts, billed by its developer, Ghost Games, as a racer set in "a nocturnal open world of urban car culture". An accidentally posted Xbox store listing revealed that *Need For Speed* will have "five ways to play," and will feature "multiple overlapping stories", which hints at a return to the thriller trappings of 2011's *The Run*. Let's just hope they leave the iffy quicktime events out of this one. According to the same leaked page, *Need For Speed* also has a release date: expect it to roll out of EA's garage on 3rd November.

Recently unveiled by EA, Need For Speed will feature "multiple overlapping stories" and "five ways to play". It's said to be scheduled for release in November

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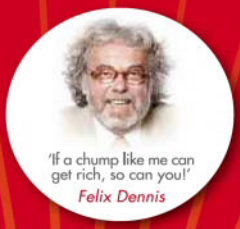

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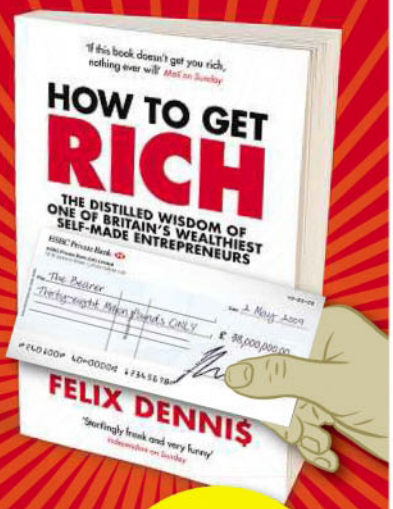

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Email:bldamsys@yahoo.co.uk

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Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Filtered

I've been having major problems with my Internet connection, which has been less than dependable over the last few weeks. I have an ADSL+2 connection, and my ISP says that I should be getting 20Mb in terms of speed. I have my own router, not the ISPs, and I have used all of my other equipment too, as I know it's cheaper to do so than to buy a new set from an ISP.

At first, my connection seemed to be okay, although I wasn't entirely sure that I was getting the promised 20Mb speeds. It was reliable, though, and was constant, with no problems with disconnects or other interruptions.

Recently, this has changed, and my connection has started to drop out often, and my speeds seem to be almost dial-up in nature. Even images on web pages take ages to load, and I can forget about trying to stream video, it's pointless. Online speed tests shows around 0.5Mb of speed, which is just terrible.

I've tried talking to support, and they've gone through the usual steps of telling me to reset my PC and modem, testing my line, and asking about my modem (which they won't support, because it's not theirs). Nothing has made much difference, and thus far an engineer is yet to visit to have a look at the problem.

I don't really now what to do next, and I think an engineer is not going to do much, as I'm not using the ISP's equipment, and if it's not my actual line that a problem, I may be stuck. Do you have any suggestions?

Lee

Barring any problems with your actual line, which I obviously can't comment on at this point, there are a couple of things that may be worth checking while you wait for an engineer to check your physical connection. As you're using your own modem, I'd perform a full reset, just to ensure you're starting from a blank slate. I'd also upgrade it with the latest firmware if you haven't already. This will give your current modem the best chance, and should eliminate most of the issues your new ISP could have with it. Of course, if your ISP won't support third party equipment, which most will not, there's always going to be the easy get out clause of blaming your hardware, until you get a compatible one.

At the very least, it's a good troubleshooting step, and could highlight the filter as the issue.

I'm surprised your ISP's support didn't try this as it's often a standard step to take when diagnosing line issues. So, try plugging your modem directly into the wall socket without the filter an see if it makes any difference. If it does, then your current ADSL filter (presumably one from your previous ISP) may be the cause, and could be damaged or incompatible in some way.

"A common cause of connectivity issues is an oft-overlooked device"

A common cause of connectivity issues is an oft-overlooked device, your ADSL filter(s). These are always used with ADSL connections to prevent interference from phone lines and to ensure a strong signal, but a damaged or incompatible one could have the opposite effect, actually making your connection worse. In these cases, you're actually better off running without one. I've advised against this in the past, but I have to admit, in some situations I've looked into, running without a filter (or isolating the line as some refer to it), can make your connection much better.

You can run your ADSL this way all the time if you wish, as long as you don't make a lot of use of any phones (in other sockets in the house. This could cause connection problems too, so see how you go. You should also mention this to your ISP, as they may be able to issue you a new filter. As they don't support third party hardware, however, you may have to go out and buy a new one yourself. Good luck.

▼ ADSL filters are important, but they can cause problems too

IE Nein

My PC is running Windows Vista (SP2), and I mainly use Internet Explorer 9 as my browser. I know most people don't like Vista, and IE, but they do the job for me, and I'm sticking with them. So there! Seriously, though, I do have a big problem: IE9 has stopped working, and when I try to use it, all I get is an error that says Internet Explorer has stopped working. I've tried it over and over, but it refuses to work.

I thought that I'd try to uninstall IE9, so I could load it up again, hoping that would solve the problem, but when I try I get the message "An error has occurred. Not all of the updates were successfully installed."

I'm really not sure what else I can do to solve the problem if I can't even uninstall IE to try a fresh copy, and I haven no idea why it would stop working. The only change to the PC I know of is the addition of Google Desktop, which my Wife has been looking at. As its a separate program, I don't see why this would cause any problems. I need help.

Vic

I often find that the most likely solution is the one that's staring you in the face in these situations, and here I'd say it is indeed Google Desktop. I've seen other instances of this issue appear before, and the Windows error reports often mention Google Desktop in the application crash information.

This being the case, I'd certainly suggest you try removing Google Desktop and then giving IE9 another try. I'd be willing to bet that it'll run as normal, with no major issues. Google Desktop is an Explorer add-on, and so it does find its way into Explorer, and possibly Internet Explorer's code, explaining the issues it could cause without you realising it.

> **"The most likely solution is the one that's staring you in the face"**

The problem you have here is Google Desktop's discontinuation. The program was retired by the firm as far back as 2011, so it's not as easy to get hold of. I'd make sure your wife has the install for the program elsewhere if she wishes to use it again after you have removed it. If not, you can still find it online on many software download sites.

Google's Desktop is a decent Explorer add-on, but its development was discontinued in 2011

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Jason

Express Delivery

I have come into possession of two 512GB Plextor PX-512M6G-2280 SATA M.2 modules (quite legally!), and I'd like to build a PC that can use both of them. However, there seems to be much confusion about SATA and PCIe when it comes to the M.2 standard, and I'm having difficulty in identifying a suitable motherboard. I also have a dual M.2-to-SATA adaptor, obtained from www.flexmemory.co.uk – could this solve the problem? Any advice would be much appreciated.

Frank Everett, Hertfordshire

Every M.2 socket has a 'key' – a notch in the line of contacts. There are twelve keys – A to M but excluding I – but the only two found currently are B and M. Both sockets provide a pass-through for SATA 3.0, but it's the M-keyed job that's specifically aimed at SSDs. With this, you get SATA Express, which runs over PCIe ×2 or ×4 (two or four PCIe 2.0 or 3.0 lanes combined).

PCIe 3.0 ×4 grants a bandwidth of nearly 4GB/s (approaching 32Gbps). At the moment, however, M-keyed sockets are usually only wired as a PCIe 2.0 ×2 configuration, granting just 1GB/s (often expressed as 10Gbps). Even so, 1GB/s is a handy improvement over the 600MB/s (6Gbps) provided by SATA 3.0.

Sadly, though, most M.2 SSDs are simply shrunken 2.5" SSDs. Your Plextor PX-512M6G-2280 units fall into this category. Their sequential performance peaks at around 520MB/s, so they just use the SATA 3.0 pass-through. SATA Express is ignored. Indeed, some M-keyed M.2 sockets only actually have the SATA 3.0 pass-through, ditching SATA Express altogether.

On the desktop, Frank, SATA 3.0 M.2 SSDs offer no real advantage over 2.5" SSDs. M.2 drives have come into being mostly because conventional drives are too big for the likes of Ultrabooks, but they're not too big for even the smallest desktops. M.2 only becomes worthwhile outside of the mobile space when SATA Express is deployed.

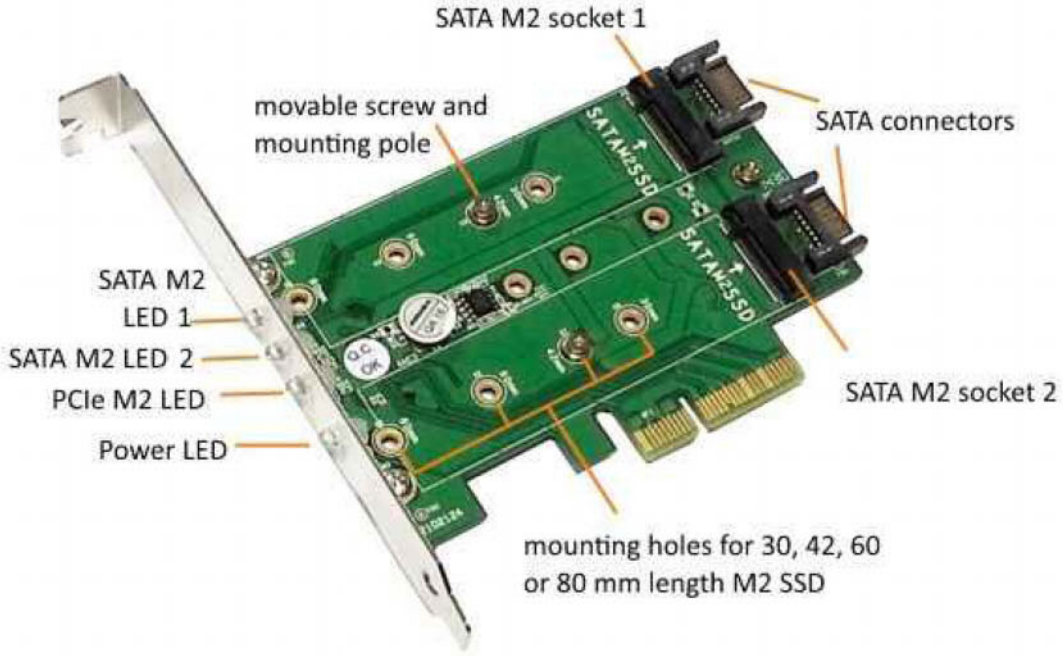
*By the sound of it, of course, your two Plextors fell into your hands for nothing, so are there any motherboards with twin M.2 sockets? Yes, but only at the high-end. For example, see Gigabyte's GA-X99-SLI (**goo.gl/VBBVOf**) – Socket 2011-3, DDR4, £180. You'd be raving mad to build a PC around that solely to make use of two free SSDs.*

Also, one of its two M.2 sockets is B-keyed and intended for a wi-fi card. As mentioned, though, B-keyed sockets have a SATA 3.0 pass-through (but no SATA Express), and luckily the Plextor PX-512M6G-2280 has notches for both the M and B keys, so in theory you'd be okay. In theory. In practice? I've no idea.

I'm not sure what adaptor you've bought, Frank, as www.flexmemory.co.uk doesn't appear to exist. Is it a PCIe 2.0 ×4 card with two SATA/PCIe M.2 sockets and two SATA data connectors? I've seen those, and I can think of no reason why one wouldn't work (the PCIe interface is just for power unless SATA Express drives are fitted). Or is it a 2.5" tray that has two SATA-only M.2 sockets and a single SATA data/power connector? I can't see that one of those would be much cop, not least because the drives' bandwidth would be slashed in half.

Looking on eBay, the PX-512M6G-2280 is fetching over £200. For a pair, after fees, you'd probably net £350, maybe more. You could buy the same amount of storage in the shape of the 1TB 2.5" Samsung 850 Evo and still have £75 left in your pocket. That's the route I'd be walking, I think.

M.2 on the desktop is mostly a waste of time if the SSDs you're fitting are SATA and not SATA Express



Dirty Laundry

I recently bought a second-hand Chromebook, an Acer C710. However, this came with the old user's Google account still in place, requiring a password. I don't know what this is, and the seller has gone silent on the matter (I'm confident the Chromebook isn't stolen, though). This means I can only log in through the guest account. I'd like to wipe everything clean and use my own Google account, and I thought this was done by clicking 'Show advanced settings' in the Settings menu and selecting Powerwash. But no such option is there. Help!

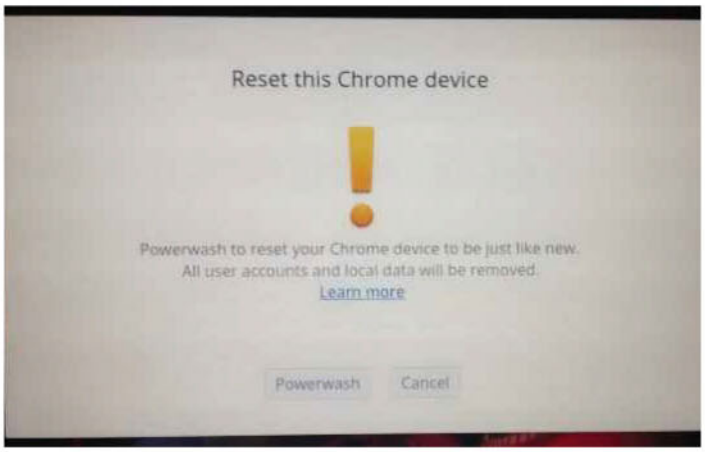
Brian, Gmail

I feel your pain, Brian. From a guest account, no apps can be added, and of course it's impossible to use services such as Gmail. The Powerwash option is indeed what you're after in order to make the Chromebook factory-fresh, but I'm afraid it's only available from a 'real' account. That makes sense, as otherwise absolutely anybody could jump onto a machine and obliterate the owner's work.

What doesn't make sense, then, is that even from a guest account you can simply press Ctrl+Alt+Shift+R (users with a 'real' account need to log out first). This brings up a hidden Powerwash setting. Click Restart, and when the Chromebook reboots, click Reset. Job done. The Chromebook will be as new, so you can start again with your own Google account.

Staggering. This really does mean that anybody for any reason can pick up anybody else's Chromebook and wreak total mayhem. Yes, the idea of a Chromebook is that you store your files in the cloud (Google hopes you'll use Google Drive, but that's not the only option), and a system-wipe won't touch those. But it's quite possible to store files locally, on the machine itself, and many people do. Ctrl+Alt+Shift+R would destroy the whole lot. Staggering.

Doing the washing really shouldn't be this dangerous



Data Hater

I'm new to the world of smartphones and am trying to get to grips with my HTC One Mini (Android). Am I right in thinking wi-fi is completely free? I don't want to rack up unexpected Internet charges. Also, when I'm away from home and away from wi-fi, how can I really be sure that the phone isn't going online? Is this even possible?

R. March, TalkTalk

*I understand your fear. wi-fi isn't *completely* free, of course, because obviously you'll be paying a service provider for your home broadband, and the wi-fi signal will be routed through that. But there'll be no other charges – don't worry about that. Actually, at McDonald's, supermarkets, big-chain pubs, and so on, wi-fi often really is free – totally. You can sit in the car park at a McDonald's and use the wi-fi hotspot without ever going near a Galaxy Cookie Crumble McFlurry.*

Basically, you'll only pay data charges (or eat into your contract or PAYG allowance) when sending or receiving via 3G or 4G – the mobile data network. A phone will always use wi-fi as a preference and revert to 3G or 4G only when wi-fi isn't available.

If you prefer, you can stop 3G or 4G being used altogether. Get into your HTC's settings. Under the Connections tab, tap 'More networks', then tap the entry called 'Mobile networks'. Under that, you'll see 'Mobile data', and if this is unticked, you'll turn your phone into a 2G-only device. You'll still be able to call and text, but it'll be impossible to rack up data charges.*

You'll also see an entry called 'Data roaming'. With this unticked, 3G or 4G will stay enabled but only when you're in your home territory. When you're abroad, for example, the phone won't try to connect to one of that country's own data networks. You won't be able to go online except via wi-fi, and you'll only be charged for calls and texts.

Unticking either of those settings will make no difference to the phone's wi-fi functionality (this has its own setting). It's entirely possible to run an Android phone without even putting a SIM in it. Lots of people use phones purely as wi-fi and GPS devices. GPS is free and doesn't need a data connection, though unless the required maps are stored on the phone itself, you'll need some way to download them.

** These are the settings as found on Android KitKat (4.4.x). Other Android versions behave slightly differently.*

Get to know your phone's data settings!

Crowdfunding Corner

If you demand more from your technology, this pair of quality-conscious Kickstarter projects will help you get it, from high-resolution inputs to high-resolution outputs

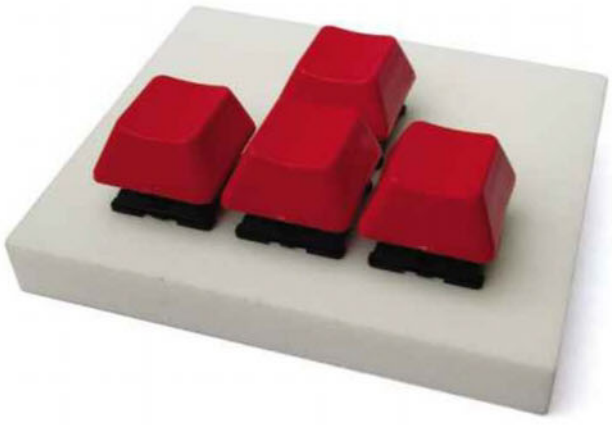
3.8% Keyboard

Gamers who feel like they'd prefer a slightly smaller, less cumbersome input device that doesn't lose the benefits of a 4-key input will be intrigued by the 3.8% keyboard, which gives you a 4-key input in the standard WASD/Arrow key configuration with a USB connection and cherry MX microswitches for high-quality and comfortable controls.

It's not just for gamers, of course – you can also use it to add standard cursor control to laptops and PCs with 60% keyboard layouts (which normally omit them). The product can be ordered in pieces (PCB & aluminium body) with only some soldering required for $31 (£20), or you can get it pre-assembled for $38 (£25). And if that doesn't look like enough keys for you, there's also a "5% keyboard" version which adds two extra keys which can be configured as QE, Esc/Del or PgUp/PgDown.

The funding target is a fairly modest $5,700 (£3,710), and there seems little danger of it missing that amount given current progress [*at time of proofing it was over a quarter of the way there with 24 days to go* – John]. Stretch goals include LEDs, a MicroUSB port, mode-toggle switch and even extra buttons. Delivery time is scheduled for August 2015, so if it gets made you shouldn't have long to wait!

URL: kck.st/1Gl9UEn
Funding Ends: Sunday, June 28th 2015



Look

We've all seen how digital picture frames can brighten up people's desks by giving them a new photo to look at every day, but what if that could be extended to entire rooms? The Look digital picture frame is a next-gen take on the concept.

Large enough to hang on walls and with a frame that looks like a normal picture frame, Look is controlled using apps, and downloads pictures from any major photo account as well as stock images from major content providers – including digital masterpieces from over 4,000 galleries and museums. With images that can react to different events and schedules, you'll always have something fun or interesting to look at!

Of course, tech like this doesn't come cheap. To get the picture frame you have to back for at least $349 (£228), and that's an early bird price. If you miss it, you'll have to pay $399 (£260). That said, the retail price of this item will be $499 (£324) so in that sense it's a bargain. The project goal of $50,000 (£32,550) has already been met – and there's still a good few weeks to go. However, if you want to back it all you have to do is organise shipping through a parcel forwarding service, because it only ships to US addresses. Still, if you're paying that much already a few dollars more probably won't hurt!

URL: kck.st/1IdsYon
Funding Ends: Thursday, July 2nd 2015

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Bolide Slideshow Creator

We get a bit arty this week

A few years ago we saw a rise in online slideshow creation tools. Applications such as Pummelvision allowed the user to upload a selection of photos, then wait as the app did its magic, arranging them in a tasteful composition to a piece of free and open-source music.

The effect was good, although it missed the personalisation that can be achieved by using a locally installed program. Unfortunately, Pummelvision, along with one or two others, have now ceased to be, but that doesn't mean we can't still create a vibrant and dynamic slideshow, worthy of the attention of our friends and family, in high definition and with the accompaniment of the music of your choice.

Slideshow Creator, from Russian software house Bolide is one such Windows application that oozes simplicity, features and other wonderful things.

Slideshows For All!

There's a lot that can be done with BSC. There's support for just about every image format imaginable, and you can import MP3, OGG, M4A and MP4 audio files, among others.

There are dozens of transition effects, pan and zoom and all manner of extras to emphasise any points you have in the slideshow. And when you're done you can output the slideshow to a full HD video file – you can even create a cartoon using BSC and stop motion animation.

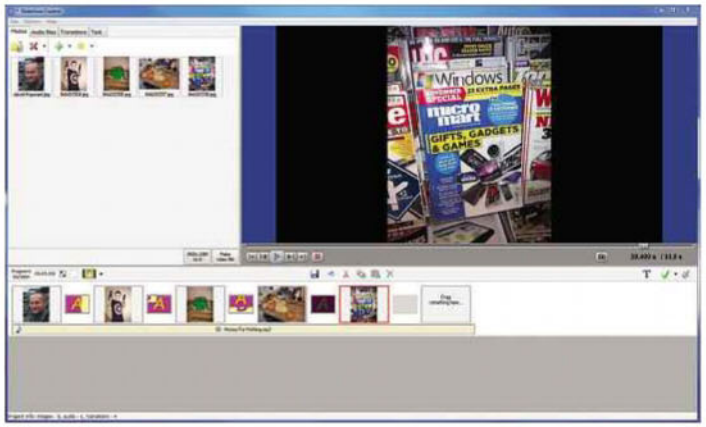
Amazingly, BSC is free, which in itself is quite an exception these days. Sure, you can achieve the same general effect from many apps on either Android or iOS but, believe it or not, there are still those of us who much prefer to use an actual computer when it comes to designing photographic content.

So Easy, Even We Can Use It

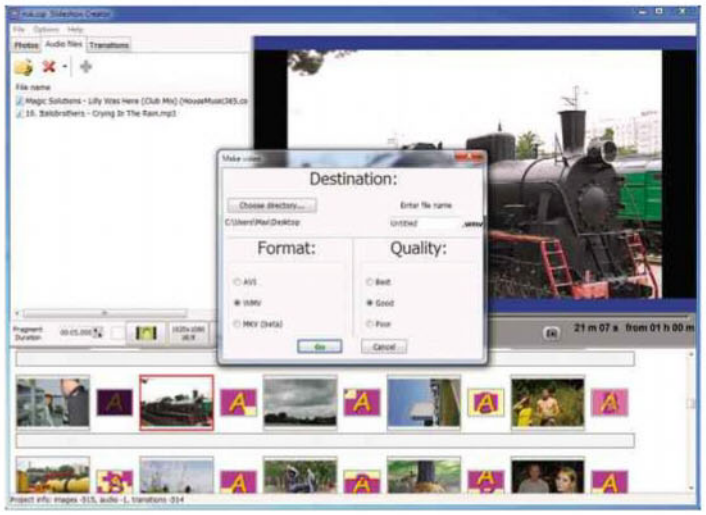
Simplicity is BSC's key factor. It doesn't contain the unnecessary bloat and twiddly bits of Microsoft Movie Maker or the all-singing all-dancing complexity of an Adobe product. It's just plain and simple, free and easy.

It's hardly surprising, then, to see that BSC has quite a following, with many a question from newcomers being answered either via the developer contacts or through the very active Facebook page.

BSC is a great little program that's regularly updated and cared for by a group of talented developers, so check it out now.



Lovingly create HD slideshows with BSC



Output your finished content to a HD video file of your choice

Features At A Glance

- Free.
- Runs on low spec PCs.
- Loads of content, transitions and so on.
- Really easy to use.
- Output to HD video files.

Logging Off

If you own a modern Android phone or tablet, you might discover that Google Wallet has been available pay for things electronically since 2011. Oh sorry, did I not mention that you need to have an account with Mastercard PayPass or Visa payWave?

I also might have missed out that you need to be in the USA to use it, and that you would be restricted to the mere 300,000 retail locations that support those two financial services in the USA.

Given those rather narrow criteria, Google Wallet hasn't exactly lit any commercial fires here or anywhere else in the world. Even in those parts of the world where it actually works it isn't a rip-roaring success.

At Google's I/O 2015 conference, it announced a new service, called Android Pay, to be introduced with the next 'M' derivative of Android. Fantastic! This tech doesn't share card numbers with the retailers, instead opting to create a virtual account number that can then interact with actual accounts inside a secure bubble at Google.

What might be a little disconcerting to potential UK users is that the announcement banged on about AT&T, T-Mobile and Verizon networks and MasterCard, Visa, AmEx or Discover card accounts. If you didn't take the hints there, this is like Wallet before it – i.e. exclusively for Americans.

What slightly does this writer's head in is that Europe has more people and a larger combined economy than the USA, but we're somehow second class digital citizens when it comes to this service. So Larry and Sergey, how does that work exactly?

Releasing yet another half-baked solution to replace the six-year-old half-baked solution doesn't seem to represent progress, so why is Google doing this? It's been propelled into action by Apple, unsurprisingly, with its Apple Pay system that actually seems to be taking off – well, in America, because you can't get it here, obviously. But when I say 'taking off', I mean that it can be used in twice the number of US locations that Wallet achieved, and it's getting a wider uptake of users.

Apple's advantage is that because it controls the OS updates on its phones (unlike Microsoft and Google), it can also control the payment options available for all their users. Google Pay success seems entirely dependent on us all ditching our phones for one running the next Android release or it convincing the mobile

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network providers to issue upgrades, which isn't in their interest. Phone networks make money from getting you to buy a new phone through them, under contract obviously, and they make no money from you getting enhanced features on the phone you've already paid for.

The very poor penetration of Android 5.0 Lollipop at less than 10% demonstrates the scale of the issue they face and how the phone networks and, to a lesser degree, the phone makers are probably destined to muck this opportunity up yet again, even before it's actually even available.

On that basis, it would seem prudent to chalk mobile payments up as a victory for Apple, by default. However, the fine irony here is that even when Apple Pay comes to this country, those who have gone out and bought a new iPhone 6 (or 6S) and the Apple Watch probably won't have much money left in their accounts to pay for anything.

Mark Pickavance

LAST WEEK'S CROSSWORD

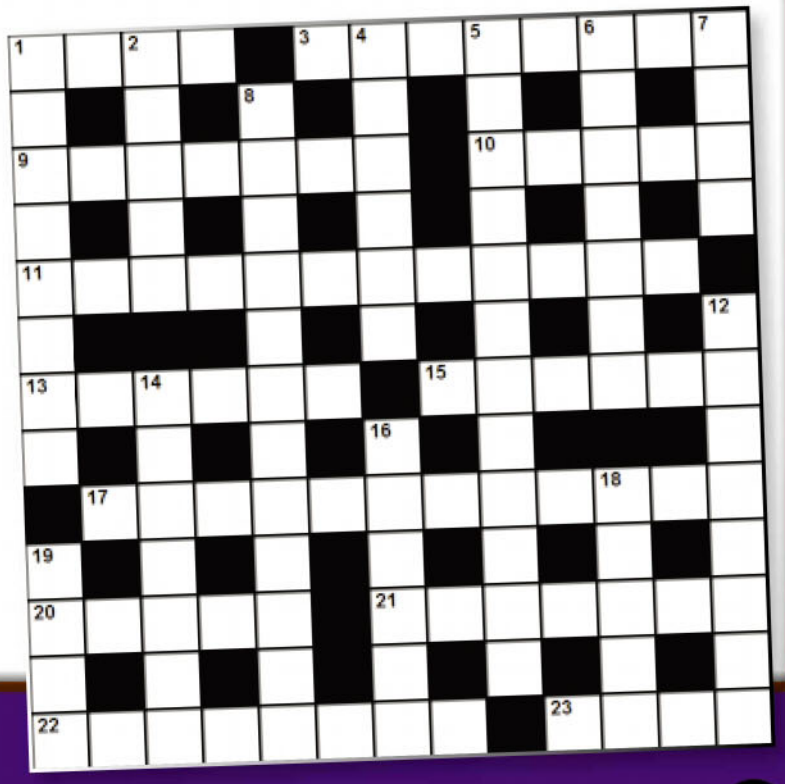
Across: **1** Tuba, **3** Adorable, **9** Gesture, **10** Oscar, **11** Technobabble, **13** Euclid, **15** Shogun, **17** Digital Detox, **20** PhpBB, **21** Profile, **22** Perceive, **23** Heat.
Down: **1** Together, **2** BASIC, **4** Dweebs, **5** Rhombohedron, **6** Backlog, **7** Ecru, **8** Quantifiable, **12** Inexpert, **14** Crimper, **16** Karpov, **18** Trite, **19** K-Pop.

DISCLAIMER
The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. By the time you read this, we'll be well and truly in the month of June, and that can mean only one thing: we should finally start thinking about getting our tax return ready. Yes, we know we've got until January, but it's good to get these things out of the way relatively early. That said, last year, we did it in April, so we're slipping a bit. Whatever the case, one thing we've learned from doing this over the years is that our plans to buy a house in London might be delayed by a couple of hundred years or so. At our current rate, we should be able to buy a wheely bin in Peckham by roughly the 27th century. Of course, we're just kidding: we don't really want to live in London, even if Laura, our designer, does. Speaking of Laura, she's just returned to the UK after spending three months swanning about in Asia, taking photos of monkeys eating packets of crisps and probably getting up to no good. Anyway, we're clearly paying her too much, so from next week, she'll be getting paid in wine gums (but not the black or red ones – those are ours).

THIS WEEK'S CROSSWORD

Across
1 A widely held but false belief or idea. (4)
3 A portable mat or surface that provides traction for the ball of a computer pointing device. (8)
9 Term for a by-product or a product made during the manufacture of something else. (7)
10 Internet personalisation technology and online marketing company formerly known as 121 Media. (5)
11 The parallel of latitude 66° 33' north of the equator. (6,6)
13 A young man in ancient Greece, especially an 18-20 year old undergoing military training. (6)
15 Divide a computer disk into marked sectors so that it may store data. (6)
17 Present in a former state or previous to something else. (12)
20 A feeling of listlessness and dissatisfaction arising from a lack of occupation or excitement. (5)
21 The rapid expansion of matter from a state of extremely high density and temperature, which marked the origin of the universe. (3,4)
22 Dynamic objects such as a non-player characters or items in computer games and game engines. (8)
23 The 'R' in RTF. (4)

Down
1 Wrong actions attributable to bad judgment, ignorance or inattention. (8)
2 A three-electrode semiconductor device that will conduct in either direction when triggered by a positive or negative signal at the gate electrode. (5)
4 Microsoft, Libre, Open or Ability among others. (6)
5 An electromotive force in excess of 200 kV used in X-ray radiotherapy. (12)
6 In geometry, a proposition in which something has to be constructed. (7)
7 Successor to the SIMM. (Acronym) (4)
8 French aviator who in 1909 made the first flight across the English Channel. (5,7)
12 The amount of energy transmitted by acoustic or electromagnetic radiation. (8)
14 Slang term for a tough, unyielding or insensitive person. (4,3)
16 The character or quality of a musical sound or voice as distinct from its pitch and intensity. (6)
18 An organisation running canteens and shops for British service personnel. (Acronym) (5)
19 Relinquish possession or control over. (4)



Top 5 Things Steve Ballmer Has Done

Love him or hate him, you certainly won't forget him

1 The Monkey Dance

Some people need alcohol or narcotics to get really worked up, but not Steve Ballmer. He just needs a stage and several thousand people looking at him. No doubt fuelled by the immense size of both his audience and his bank balance, he famously leapt about at a company event in 2000, whooping and dancing with joy, ordering everyone to stand up, before declaring, at the very top of his voice, his dedication to his employer: "I have four words for you! I! Love! This! Company!" Thanks, Steve, we also have four words for you: That. Was. Very. Scary.

2 Developers

Anyone familiar with the 'Developers' meme will know that this speech was famously combined with the monkey dance to create a pretty decent music video. But even without that, the original footage is pretty remarkable. Once again on a stage in front of thousands, Steve Ballmer stood clapping and chanting the word 'developers' over and over, his voice climbing in pitch before ultimately cracking up into silence (this presumably being the point he reached the ultrasonic range). Also, there was sweat. Lots and lots of sweat.

3 Weird Advertising

Never one to shy away from, well, anything, Steve Ballmer has filmed numerous adverts and promos for Microsoft and its products (including a couple with Bill Gates). However, it's the one that he did for Windows 1.0 that we're talking about here. Once you've seen it, you can't forget it. Why? Maybe it's the horrendous 1970s suit he wears in it. Or perhaps it's the fact that it all looks so rubbish now, compared to what we're used to these days. More likely, though, it's thanks to Steve's unbridled zeal, his overly loud voice and his cold, terrifying eyes as he tells you how vital it is that you buy Windows. You will obey.

4 Calling Linux A Virus

"Linux is a cancer that attaches itself in an intellectual property sense to everything it touches." Harsh words from the one-time Microsoft supremo, who clearly doesn't go home every night and play around with his Ubuntu swap file. Everyone is entitled to their opinion, of course, but the problem with Steve's assertion, from an interview, with the Chicago Sun-Times, is that it was based on a complete misunderstanding of the GNU General Public License. But as Mark Twain once said, "Never let the truth get in the way of a good story."

5 Quitting

Sometimes, he could be obstinate and out of touch; other times, he could be amusing and seemingly insane. Whatever the case, it's clear Steve Ballmer was also a passionate and, at times, successful vice president and CEO at Microsoft. However, it's also true that the company released many failed products under his stewardship, and by the time he eventually stepped down, we doubt many people were trying to persuade him to stay on. It was time to go, and he knew it. We'll miss his crazy antics, but don't feel bad for him: the latest reports suggest he can now be found most days happily swimming around in gold coins like Scrooge McDuck, while screaming, "Billionaires, billionaires, billionaires!" **mm**

imagemaker / Shutterstock.com

Contrary to theories among the Micro Mart team, Mr Ballmer isn't actually a robot sent from the future to kill us

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